ELECTRIC LIGHT CONVENTION.—No. 3.

ILLUSTRATED ELECTRICAL REVIEW

A Journal of Scientific and Electrical Progress.

VOL. 30. No. 23. WEEKLY. NEW YORK, WEDNESDAY, JUNE 9, 1897. $3 PER ANNUM. Single Copies, 10 Cents.

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VIEWS, NEWS AND INTERVIEWS.

The Pennsylvania Railroad Company is always up to date. Its most recent proof of that is the establishment of the uptown service to West Twenty-third street. The company has erected a handsome ferry house, built new double-deck boats, which surpass anything yet built for ferry service, modern in every detail, and ablaze with electric lights. The company has also established, at the same ferry, a hansom, coupé and cab service on a reasonable tariff basis, and patrons of the road are greatly elated over the satisfactory results.

The new "radiotint" method of color photography is striking in its originality and results. Yet it is not iconoclastic, as the ordinary manipulations of the sensitized plate and the silver printing are retained, and the new features are extremely simple. The one drawback seems to be the presence in the print of black shadows and half tones, instead of the transparent and beautiful shadows and half tones of nature, from which black is absent. The new process, however, is destined to become popular and wide-spread.

At the dinner of the American Institute of Electrical Engineers, last month, there was quite an increase of diners at the last moment, which compelled an overflow into the adjoining room, where a majority of the younger electrical pioneers gathered. They were having such a good time that the toastmaster in the adjoining room notified the "Steerage," in a jocular way, that it would be necessary for its occupants to keep quiet or they would be thrown overboard, and signed it "Saloon." An order was immediately sent in from the "Steerage" for a case of champagne, which Mr. R. T. Lozier saw delivered and executed, and the "Steerage" was permitted to have its fun in its own way thereafter. The occasion was a very enjoyable one, and it showed that the gentlemen of science and technical study were not averse to occasional relaxation.

Efforts are afoot in Johnstown, Pa., to install a police call and ambulance system, but considerable opposition has appeared in councils. Johnstown is big enough to have all the trimmings of advanced municipal management, and the measure should pass.

In a remarkable article on "Recent Science," in the *Nineteenth Century*, by Prince Kropotkin, the writer remarks that we conceive of gases as consisting of an immense number of molecules dashing about in all directions, and that some such conception must now be formed of metals, whose molecules have a certain mobility—that in fact they never cease to move about and to enter into new and varied combinations. It has become more and more apparent, says Prince Kropotkin, that a block of an alloy is quite a world, almost as complicated as an organic cell. Cylinders of different metals, as shown by the experiments of Professor Spring, may be so well welded together, at a temperature very remote from their melting points, that when they are afterwards torn asunder, quite new surfaces of tearing are produced, and new alloys are formed between two cylinders. Also it has been proved that solid metals evaporate from their surfaces exactly as if they were in a liquid state, or as camphor evaporates, while remaining solid, so that if we were endowed with a finer sense of smell we would smell metal at a distance.

MR. HENRY CLAY, OF PHILADELPHIA, 1ST VICE-PRESIDENT NATIONAL ELECTRIC LIGHT ASSOCIATION.

MR. FREDERIC NICHOLLS, OF TORONTO, CANADA. PRESIDENT NATIONAL ELECTRIC LIGHT ASSOCIATION, IN SESSION THIS WEEK AT NIAGARA FALLS.

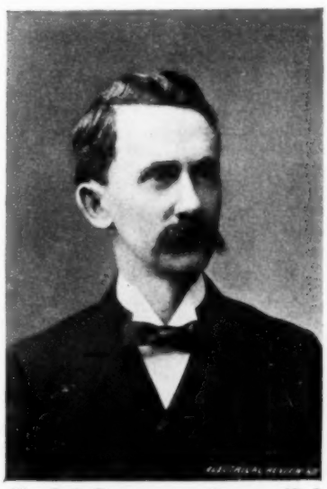
THE CONVENTION THIS WEEK.

Niagara Falls in the Hands of the Electric Light Men.

THE OFFICIALS WHO MANAGE THE AFFAIRS OF THE ASSOCIATION—SOME OF THE VAST ELECTRICAL INTERESTS AT NIAGARA FALLS—PASSENGERS ON SPECIAL TRAINS—VISITORS FROM A DISTANCE.

The zealous and earnest advocates of illumination by the electric light, and all allied interests, are in session at Niagara Falls, N. Y., as this edition of the ELECTRICAL REVIEW goes to press.

It is the occasion of the 20th meeting of the National Electric Light Association, which was organized in February, 1885, in Chicago, a little over 12 years ago.



MR. J. J. BURLEIGH, OF CAMDEN, N. J 2D VICE-PRESIDENT NATIONAL ELECTRIC LIGHT ASSOCIATION.

For several years conventions were held semi-annually, but for the last few years one convention a year only has been held.

There are in attendance at the convention this week delegates from California and New Orleans, from Canada and the farther Atlantic coast, and from Europe.

President Nicholls and Secretary Porter of the association have been indefatigable in their efforts to make this convention a particularly successful and instructive occasion, and their efforts have been highly successful as is evident from dispatches received in New York city, Tuesday morning, as

MR. A. MARKLE, OF HAZLETON, PA., MEMBER OF EXECUTIVE COMMITTEE.

the REVIEW goes to press, that the attendance will probably score the largest number ever present on a similar occasion.

We present in this issue pictures of the president and a number of the officers of the association, men who have labored long and intelligently in the field of electric illumination, and who have devoted their time and ability to advancing the interests of the association.

THE OFFICIALS.

Mr. Frederic Nicholls, the president of the National Electric Light Association, is a subject of Queen Victoria. He was educated at Stuttgart, and has served successively as a member of the executive committee and as second and first vice-president. Mr.

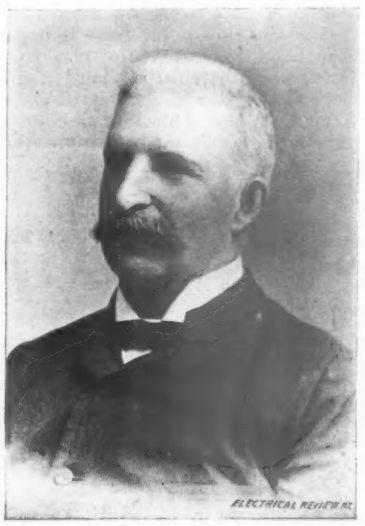
MR. W. R. GARDENER, OF PITTSFIELD, MASS., MEMBER OF EXECUTIVE COMMITTEE.

Nicholls is largely interested in electrical, insurance and financial organizations of Toronto.

Mr. Henry Clay, the first vice-president, is president and general manager of the Northern Electric Light and Power Company, Philadelphia. During the six years he has controlled modern methods have been adopted, reducing the cost of production about 40 per cent and price to the consumer 35 per cent; yet, notwithstanding the reduction, the gross revenue of the company is 43 per cent greater than it was in March, 1891. The capital of the company is $650,000, and the plant is operated the entire 24 hours each day. The company pays an annual dividend of 10 per cent.

The second vice-president, Mr. J. J. Burleigh, is the general manager of the Camden Lighting and Heating Company, Camden, N. J., who began his electrical experience in 1869 as telegraph operator, afterwards constructing telegraph and telephone lines. He assumed his present position in 1880, and has extensive interests in a number of other companies, gas, water and financial.

Mr. William R. Gardener, of the executive committee, is probably the youngest of this series of officials, and is assistant manager and purchasing agent of the Pittsfield Illuminating Company, Pittsfield, Mass. Mr. Gardener has made a special study of central station data, and is the author of several papers on this subject and several inventions. He is one of the charter members of the Stanley Electric Manufacturing Company, of Pittsfield, and is thoroughly equipped for making an electric light station pay and for managing it in a thoroughly up-to-date manner.



MR. GEO. REDMAN, OF ROCHESTER, N. Y., MEMBER OF EXECUTIVE COMMITTEE.

Mr. A. Markle is the general manager of the Lehigh Traction Company, at Hazleton, Pa., is actively interested in electric lighting and electric traction, and is a valuable member of the executive committee.

Mr. George A. Redman, of Rochester, N. Y., is a very widely known electric light official, and began his electrical career as messenger for the Western Union Telegraph Company, being promoted along the lines to head bookkeeper and manager of the American District Telegraph and the Edison Telephone Company, of Rochester. He is now the superintendent of the Brush Electric Light Company of that city, and also general superintendent of the electrical department of the Rochester Gas and Electric Company.

Mr. John A. Seeley has been actively engaged in electrical work, holding responsible positions in the telephone, electric lighting, and electric railway fields, and is at present engaged in some heavy construction work at Syracuse, N. Y.

Mr. A. M. Young, of Waterbury, Ct., has very extensive electric lighting and electric railway interests and is the president and treasurer of probably over a dozen successful and growing electrical organizations. Mr. Young is also president of the New England Engineering Company, one of the most widely known and successful engineering and constructing organizations in the electrical field. He started in electrical life in the early days of the telegraph.

Other members of the executive committee are Mr. Charles R. Huntley, a leader in everything electrical in the city of Buffalo, N. Y., and a former president of the National Electric Light Association; Mr. A. J. De Camp, of the Brush Electric Company, of Philadelphia, Pa., who has been identified officially with the National Electric Light Association since its second meeting in New York in 1885; Mr. H. A. Wagner, of St. Louis, and Mr. W. W. Carnes, of Tennessee.

The secretary and treasurer of the association is Mr. George F. Porter, who has served in this capacity for several years. The members of the association will universally regret that this will be the last convention at which Mr. Porter will act in this capacity, as he has decided to actively enter another line of work in the electrical field immediately after the adjournment at Niagara Falls.

We also present the latest photograph of the genial master of transportation of the National Electric Light Association, Mr. Cyrus O. Baker, Jr., the head of the large platinum importing and refining house, of Newark, N. J., and he has also extensive electric lighting and electrical manufacturing interests. Mr. Baker has been a zealous friend of the association for many years, and

MR. JOHN A. SEELEY, OF SYRACUSE, N. Y., MEMBER OF EXECUTIVE COMMITTEE.

in the capacity of master of transportation, has contributed in no small degree to the success of the conventions. There are few men at all allied with electrical interests who have so wide or friendly an acquaintance as Mr. Baker.

TUESDAY'S NEWS.

[Special to ELECTRICAL REVIEW.]

NIAGARA FALLS, June 8, 1897. —Among those arriving Monday night on the special train from New York were: T. C. Martin, Mr. and Mrs. Joseph Wetzler, Jefferson W. Wetzler, A. C. Shaw, Luther Stieringer, S. W. Young, Joseph L. Belote, W. M. Chamberlain, Marcus Nathan, Frank Johnson, C. T. Child, Joseph Sachs, Wells E. Holmes, N. W. Perry, C. D. Shain, Robert E. Wyant, T. E. Hughes, A. Henderson, H. B. Kirkland, Paul Lupke, Col. J. H. Shay, E. H. Stevens, C. L. Towles, A. J. Jones, T. H. Brady, W. J. Newton, J. H. McGhie, M. B. Webster, E. L. Powers, M. R. Cockey, B. E. Green, S. W. Wise, Mr. and Mrs. C. B. Price, Mr. and Mrs. H. B. Jagoe, Mr. and Mrs. C. O. Baker, Jr.; F. B. H. Paine, E. H. Bennett, Jr.; D. C. Kenyon, Mr. and Mrs. H. B. Cutter.

There have arrived also Frank P. Adams, Stockton, Cal.; W. N. Stewart and W. L. Modgen, London, Eng.; Arthur Wright and Henry Reason, Brighton Eng.; Louis O. T. Schaffer, Antwerp, and William von Phue, New Orleans.

MR. A. M. YOUNG, OF WATERBURY, CT., MEMBER OF EXECUTIVE COMMITTEE.

The name of Samuel Insull, president of the Chicago Edison company, is mentioned as the probable successor of President Nicholls.

About 375 delegates and a large number of ladies have arrived by 10 A. M. to-day, and others are constantly coming in, filling all the hotels. President Nicholls and Secretary Porter and staff are on hand in charge of affairs. Convention will assemble about noon.

The exhibits are quite interesting and numerous, and are getting into shape in the hotel corridors and rooms.

An unusual welcome was extended the special train from New York and Boston on its arrival in charge of Transportation Baker. A brass band of 28 pieces welcomed the visitors when the train rolled in, and gave a

MR. CYRUS O. BAKER, JR., OF NEW YORK, MASTER OF TRANSPORTATION OF NATIONAL ELECTRIC LIGHT ASSOCIATION.

serenade that drowned the noise of the falls and awoke the sleeping villagers here and across the river in Canada. Band played "Lo the Conquering Hero Comes" and "God Save the Queen."

This promises to be a big convention. STEPHEN L. COLES.

ELECTRICITY AT NIAGARA FALLS.

The recent development of electricity from power derived from Niagara Falls has attracted great attention in all parts of the world, especially in our own country. The magnitude of the work undertaken would command the interest of electrical engineers, in any event; but the enormous amount of water-power undeveloped in all sections of the country renders the work more so, for, if it is successful, other developments are sure to follow. Niagara Falls has always been one of the wonders of the world on account of its marvelous natural beauties, and that it is nowadays peculiarly so to the electrical fraternity is evinced by the fact that no less than four electrical conventions will be held there this year.

There are in Niagara Falls two power districts in all respects independent of each other. The Niagara Falls Hydraulic Power and Manufacturing Company supplies a number of flour and paper mills, and various other factories situated on the bluff of the lower river just below the upper suspension bridge. The power is supplied from a surface canal, whose inlet is at Port Day, about one mile above the falls. The canal conveys water through the city to a basin running parallel to the bank of the lower river, whence it is led into a forebay, and thence into the penstocks supplying the various water wheels. A glance at the river bank will show that a great deal of power is wasted in this district from the fact that most of the water wheels in use run under heads varying from 40 to 100 feet. Last Fall, however, the Hydraulic Company put in operation a new power-house, which is, in all respects, modern and up to date.

The power-house is situated at the foot of the bluff on the river bank. Here are installed six Westinghouse and two General Electric 750 horse-power direct-current generators, which are driven in pairs by four 1,700 horse-power Leffel turbines of the horizontal type, to which they are direct connected on opposite ends of the turbine shafts. The water wheels work under a head of 206 feet, and are supplied from the canal basin above by a penstock nine feet in diameter. The Westinghouse dynamos are owned and used by the Pittsburgh Reduction Company, who buy water power from the Hydraulic Company and use the 3,000 electrical horse-power generated, at a pressure of 300 volts, in their factory situated on the bluff directly overlooking the power-house. The General Electric dynamos are owned by the Hydraulic Company and supply power, at a pressure of 550 volts, to various concerns, including the trolley lines running through the Niagara gorge and from Lewiston to Youngstown. About the most noticeable feature in this power-house is the absence of any automatic governing arrangements on the turbines supplying the Westinghouse dynamos. As the load of these machines is approximately constant, practically no regulation is needed, and the water wheels are opened and closed by hydraulic pressure.

Turning now to the Niagara Falls Power Company district, we find owing to the very recent installations in all the different factories, as well as in the main power-house, many unusual features that will attract the attention of electrical engineers. The center of interest, of course, is the power-house, where 15,000 electrical horse-power is already installed and an addition being made to increase the capacity of the plant to 50,000 horse-power. Probably no installation of late years has been so much written about and discussed in every imaginable way. We will not attempt to describe this in detail, but will merely give a few facts concerning the dynamos, etc., which would probably answer the questions asked by visitors to this plant.

FIG. 1.—VIEW OF THE STATION OF THE NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY.

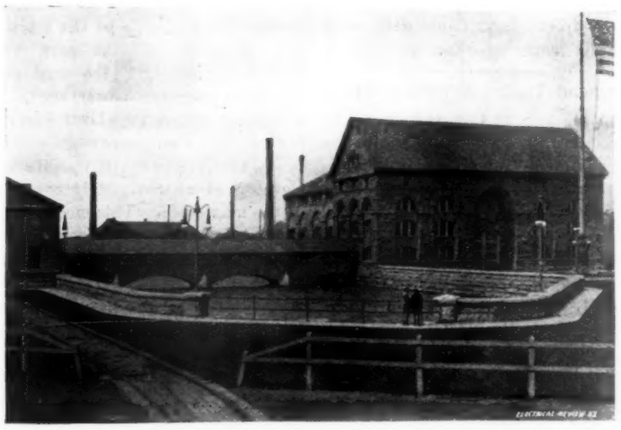


FIG. 2.—"ELECTRICITY AT NIAGARA FALLS"—THE GREAT POWER-HOUSE OF THE NIAGARA FALLS POWER COMPANY.

Taking the dynamos, in the first place: these were manufactured by the Westinghouse Electric and Manufacturing Company, are each of 5,000 horse-power output, and are driven by turbines situated 140 feet below, to which they are direct connected by hollow shafts. Everything about these machines seems to be reversed from the usual practice, the armature being stationary and the field revolving on a vertical axis. One is impressed by the immense power being generated when he watches the periphery of these great dynamos, revolving at a speed of 250 revolutions per minute, giving a velocity of 9,300 feet per minute to the outer section of the ring. Beside each dynamo stands a water-wheel governor, designed by Faesch and Piccard, of Geneva, Switzerland, and manufactured in this country by the I. P. Morris Company, of Philadelphia. While these governors seem complicated at first glance, yet their mechanism works so smoothly and with such regularity that the speed is kept practically constant. These dynamos, running as they do in parallel, must all have exactly the same speed; any change in the adjustment of one of the governors merely serving to increase or decrease the load on the dynamo which it controls. This calls one's attention to the fact, also, that changing the relative strength of the dynamo field has no effect on the load of the dynamos, their load being dependent altogether on the amount of water being admitted to the turbine, and that being governed by the adjustment of the governor.

Next to the dynamos, the most interesting piece of machinery, to a great many visitors, is the 50-ton electric crane which travels forward and back the length of the power-house, and lowers the heavy weights to the bottom of the wheel-pit—a depth of 200 feet.

In the northwest corner of the power-house, on the main floor, are installed three 500 horse-power rotary transformers, which receive the alternating current from the main dynamos through static transformers, convert it into direct current, and thus supply all the local railway systems, together with a number of small factories and mills needing current of this description for their motor circuits. No street-car service can possibly be more satisfactory than this is. The great size of the main dynamos, from which this power is derived, renders any change in the load of comparatively small moment, so that the voltage is practically constant.

Situated in the center of the dynamo-room stands the switchboard structure, on which are mounted individual stands for each dynamo, and also for two 200-kilowatt rotary transformers which are used to excite the fields of the main machines. From this point all the switches are operated by handles, the switches being installed inside of the structure, together with the main bus-bars, instrument converters and field-controlling apparatus.

There are many details connected with this model installation which are of great interest to the electrical fraternity. For instance, much might be written about the method of lighting the building and grounds surrounding it. It was thought at first that, owing to the low frequency of the current generated, it would not be practicable to use it on incandescent lamp circuits, but during the last year it has proven highly satisfactory. The offices situated in the wing on the east side of the building are supplied from three 25-kilowatt transformers located over the doorway, from which mains run to a switchboard in the engineer's office, and from there feed heating and lighting circuits. Standard 110-volt lamps are used of 16 and 50 candle-power.

Another interesting point is the method of heating the main dynamo room. Notwithstanding the appreciable amount of heat given off by the dynamos, the room, on account of its great size, was found to be much too chilly for the comfort and health of the operatives. Accordingly, 15 heaters were made from a design of the electrical superintendent, Paul M. Lincoln, and mounted on iron brackets on the side walls of the building. These heaters are connected in sets of five on the 2,200-volt circuit, and use about 200 horse-power per set. The preceding winter has shown that one of these sets is amply sufficient to keep the temperature of the room at about 70 degrees Fahrenheit, except on very cold nights, when two sets have occasionally been used.

Situated on the lands of the Niagara Falls Power Company are the factories which, at present, consume the greater part of the power generated. At the Pittsburgh Reduction Company's works there is a transformer room adjoining the main factories and belonging to the Power Company, where are installed five 800 horse-power rotary transformers, supplying 15,000 amperes direct current, at a pressure of 165 volts. Here perfection may be said to have been reached in the practical operation of rotary transformers, especially in the management of the brushes, both on the collector rings and on the commutators. After much experiment in lubricating compounds, a very satisfactory one has been devised, and this, together with an ingenious arrangement which gives the armature an oscillating effect, renders it

possible to keep all the sliding contacts in splendid condition, there being no cutting of rings or commutators of any consequence. This oscillating device, made by I. R. Edmands, of the General Electric Company, consists of a small electromagnet attached to one of the pillow blocks and having an automatic make-and-break contact. When the magnet is in action it draws the end of the shaft towards it, and, the shaft being released when the magnetic circuit is broken, the armature is given an oscillating motion from its tendency to draw back to its normal position beneath the pole pieces.

Near by the Pittsburgh Reduction Company are the factory buildings of the Carborundum company, in one of which is installed the electrical apparatus which reduces the voltage from 2,200 to from 200 to about 110. This variation in the secondary voltage is accomplished by means of a Thomson regulator, made by the General Electric Company, as is also the 830 kilowatts, oil-cooled transformer.

Several blocks beyond these factories are the buildings of the Mathieson Alkali Works, now in course of construction, and between these buildings and the river are the works of the Niagara Electro-Chemical Company. Here are installed three 200 kilowatts Westinghouse rotary transformers, one of which is of especial interest, in that it is the first induction rotary transformer ever put into commercial operation. Just across the street is situated the factory of the Acetylene Light, Heat and Power Company. This company, starting with a small plant, using about 400 horse-power, is now about to put in operation 25 arc furnaces, which will use about 3,000 horse-power in the manufacture of calcium carbide, from which acetylene is produced.

In addition to these companies, the Chemical Construction Company and Albright & Wilson, Limited, have erected factory buildings some distance to the eastward and will soon be in operation.

Another interesting work now being conducted on the power company's lands is that of the Hygeia Ice and Refrigerating Company, which has recently installed a model plant and is now using Niagara Falls power in the manufacture of ice by the ammonia process.

Besides operating the various electrical railroads in the vicinity and sending 1,000 horse-power to Buffalo for the railway service there, power is also supplied to the local lighting company. In this company's station are installed two 250 horse-power, 2,200-volt induction motors, which drive a line of shafting to which are connected, by belts, the regular lighting machines of the company, consisting of Brush arc machines, and General Electric alternators. These motors were designed to take the place of the old steam engines, one of which is still retained, ready to be put in operation in case of any accident occurring to the motors. Nearly one half of the city lighting is provided from this station, one of the arc-lamp circuits being nearly 15 miles long. The rest of the city is supplied from a station which is operated by power from the Hydraulic Company, the machines being in the basement of the Cataract Milling Company.

Thus we see that the falls of Niagara are not only supplying power for the manufacture of articles which have a world-wide use, but they are also being used for advancing the material comfort of the resident community, which has always, naturally, considered them its especial property. The genius of man has not only harnessed the grandest and greatest waterfall in the world to do his bidding, but has accomplished it in such a manner that energy, measured by thousands of horse-power, may be taken from it without detracting from its beauty an iota.

FIG. 3.—TWO OF THE FACTORIES IN THE POWER DISTRICT, NIAGARA FALLS, N. Y.

Overhead Trolley Without Wires.

An electric trolley system to be introduced in Paris in time for the International Exposition in 1900 is different from that commonly employed in the United States, inasmuch as the overhead wires are done away with. The new system is the invention of the French engineer, Bochet, who establishes overhead contacts from the electric lamp posts belonging to the city, the distance between posts being somewhat smaller than the length of the electric train consisting of two or three cars, so that contact is always assured at one point at least. Through flexible points of contact suspended from each electric light post along the proposed line the current will be taken up by means of a copper rail fastened along the edge of the roof of the car not less than 14 or 15 feet from the ground. The contact point will slide along that copper rail, and, it is claimed, there is no difficulty in establishing a continuous current if the points of contact are made sufficiently elastic. The current returns to the power station through the track as usual. This system claims all the benefits of the overhead as well as of the underground systems without any of their shortcomings.

FIG. 4.—FACTORIES OF THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

Storage Batteries for Elevator and Lighting Service in Large Office Buildings.

TO THE EDITOR OF ELECTRICAL REVIEW:

Replying to your inquiry as to recent developments in the application of storage batteries to lighting and power work, I may mention, as a comparatively recent development in the line of an old application, the operation of accumulators in modern office buildings served by electric elevators. A storage battery, as an auxiliary to the generating plant, operated in such a service will effect, in the great majority of cases, a marked saving in coal consumption, in labor and in depreciation of the generating plant, and will very considerably add to the reliability of the service. The uneven loads in electric elevator service, due to the starting and stopping of the cars, very materially increases the coal consumption per horse-power hour. In a building, where the elevator service is a constant one, the average amount of power required to operate the elevators is approximately one-third of the maximum. This means that a generator of sufficient capacity to take care of the maximum load has a load factor of approximately 33⅓ per cent. As the trips of the elevator become less frequent the average load, and consequently the load factor, drops.

In order to obtain a satisfactory lighting service, it is necessary to operate for the lamps a separate machine from that used for furnishing power to the elevators, as the uneven elevator load causes such fluctuations in the voltage as to produce an unsteady light. By the installation of a battery, the lighting and elevator services at the same potential may be taken from one generator, the machine carrying in addition to the lighting load, the average load required in the elevator service, the battery meeting all the demands above the average and re-charging when the load is below the average. With the battery, the machine is run under a steady load at or near its point of highest efficiency; without the battery two machines are operated, one at least, having an unsteady load with wide fluctuations and a low load factor.

Tests that have recently been made of a direct connected generating set of modern type, operated under an unsteady and widely fluctuating load, showed a coal consumption of 10.4 pounds per horse-power hour; the makers of the engine guarantee to produce, under a steady full load, a horse-power hour for 32 pounds of steam at 100 pounds pressure, equivalent to about four and one-half pounds of coal.

A battery operated in the service specified above will effect a material saving in depreciation, as with it the engine is protected from the shocks and strains of the elevator load.

In an office building operated under the usual conditions, the load drops off after six or seven o'clock to a point so low that the cost of producing the energy required is very materially increased. If there be a battery auxiliary, the generating plant may shut down and the power necessary to operate the elevators and supply the lamps required during the night may be drawn from the battery, thus effecting a saving in labor.

The battery increases the reliability of the system as it is always between the dynamo and the load, protecting the former from any sudden increase of the latter, as for example, in case of the sudden appearance of a thunder storm when the lights in a building may be turned on very rapidly; under such circumstances, the battery takes care of the load until another generating set can be put into service; it will also furnish current to tide over a temporary stoppage of a generator due to accident or other causes.

Among the owners and superintendents of office buildings who are desirous of giving their tenants the best service at a minimum cost, the subject of the storage battery and the results to be obtained from its use are receiving well-deserved attention.

CHAS. BLIZARD.

New York, June 2.

Another Trial of Storage Battery Cars.

The Belgian Government has decided upon a trial of electric carriages on the ordinary state railways, starting with the 9-mile run between Brussels and Tervueren. The Belgians are adopting the accumulator system, notwithstanding the previous difficulties attending its use. The speed is to be 31 miles, reduced to 18½ miles an hour on the steepest gradients. The accumulators weigh 12 tons, the electric motors and appliances 10 tons, and the cars—which are 52½ feet long, on two bogies, and carrying 80 passengers—weigh 20 tons. The accumulators may be charged to run 72 miles. The motors are to be compound wound, the pressure of current being 500 volts. At 15 amperes the motors will run at 116 revolutions per minute, the field magnet only being excited by the shunt winding. When connected in parallel they will make 231 revolutions, the total current being 150 amperes.

THE NEW "UNIQUE" ARC LAMP.

DESCRIPTION OF THE RECENT PRODUCT OF THE BERGMANN SHOPS.

The new "Unique" long-life arc lamp, just perfected and ready for mercantile introduction by the General Incandescent Arc Light Company, New York, of which Mr. S. Bergmann is president, combines both the feature of a reduction in length, being, when freshly given carbons, 28 inches long, and the feature of a reduction in carbon consumption. Each of these points has been well met by the now universally used arc-inclosed globe, and in this new lamp, known as the "Unique" long-life arc, both the matter of length and carbon consumption have been scientifically combined in a substantial and ornamental mechanism. The upper carbon is 12 by 7-16 inches, and the lower 5 by 7-16 inches. The length light attained is 100 to 125 hours from a single trimming. The lamp burns singly, with a current consumption approximating five amperes on a constant-potential circuit. The inner bulb inclosing the arc is made either of clear or alabaster glass, screwing at the lower end of the bulb seat in the cross bar through the two side supporting rods. The upper cap on the bulb, as shown in the illustration, through which the upper carbon passes centrally, is an iron casting fitting the top of the glass, and the upper side is coned so as to fit the conical seat in the lower side of the base plate, when pushed up in position for operation. Heretofore, the method has usually been to allow the caps some movement for proper alignment of the carbon, but in the "Unique" lamp an excellent effect is gotten by holding rigidly both the bulb and cap. The higher carbon is entirely free from rods, passing through the opening in the bulb and clamped at its upper end in a short concentrically clamped rod, which is used to add weight to the carbon and permit of its almost entire consumption, feeding until stopped by the rod striking the top of the cap. The bulb's seat bar holds the lower end of the bottom carbon.

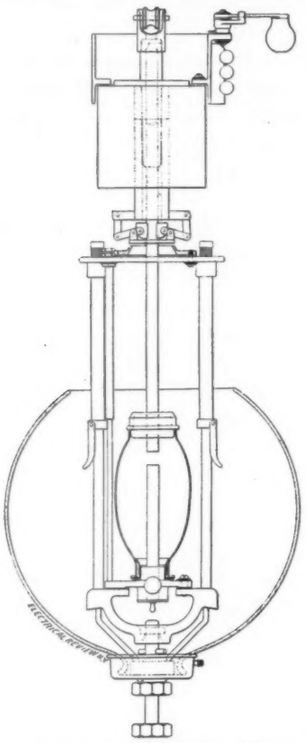


FIG. 1.—THE NEW BERGMANN "UNIQUE" ARC LAMP—VIEW OF MECHANISM.

For feeding and regulating the operation of the lamp, a single, concentrically-placed series solenoid coil is used, acting on a hollow iron core, which surrounds the upper carbon.

FIG. 2.—"UNIQUE" ARC LAMP—OUTSIDE GLOBE REPLACED BY REFLECTOR.

FIG. 3.—"UNIQUE" LAMP WITH REFLECTOR AND FRAME EXTENDED.

The latter, when full length, extends upward through the coil into a supporting tube fastened to the upper part of the mechanism frame. Oppositely fastened to the lower end of the hollow iron core are two short studs, at the outer end of which are attached the operating levers for the clutch mechanism which acts directly on the carbon. The clutch is of the duplex-balance grip type, and will readily be understood by reference to the illustration, Fig. 1. When lowered so that the weight connected to each of the clutch shoe levers, centrally pivoted thereon, rests on the stop block on the lower base, the clutch shoes are thrown upward, releasing the carbon for feeding. As the core is drawn into the solenoid, the weight pulls the shoes down against the sides of the carbon, which is then gripped and pulled upward to form the proper arc. In order to produce a sufficiently gradual movement, the core is arranged to act as a dash-pot piston, acting in the coil spool, whose upper end is closed and has a downwardly projecting tube through which the carbon passes between the latter and the core. A noticeable feature is the entire absence of springs and devices which are in any way liable to require attention or frequent adjustment.

An original arrangement is adopted for supporting and lowering the outer globe for trimming and cleaning.

In each of the two side rods are telescoped two others. The inner smallest rods are fastened at the lower ends to the globe-supporting cup, which is centrally fitted with a latch arranged to co-act with an opening in the cross bar connecting the two central rods. After being lowered the globe is raised half way for trimming by telescoping the smallest rods into the central rods, and is held in this position by turning the latch in the opening in the cross-bar. Then the central and telescoped inner rod and globe are both pushed upward until the central rods are caught on each side by a latch fitted to the outer rods, and the globe is then in its proper operating position. When lowering the globe the latch in the globe cup is first operated and then the two side latches. Both operations can easily be accomplished with one hand. By means of the simple globe and bulb detaching devices the cleaning and trimming of the lamps is reduced to the greatest simplicity. In trimming it is only necessary to unclamp the lower carbon and then detach the other from its clamp rod and allow it to fall through the same opening.

FIG. 4.—LOWER FRAME EXTENDED WITH OUTSIDE GLOBE AND BULB.

The resistance is in the form of a coiled wire wound around the upper end of the supporting rod on porcelain insulators. An excellent feature in this part of the apparatus is the ability to vary it by plugging out portions thereof in order to conform to the exact voltage on which the lamp is to burn.

The minimum height and the maximum light may be accomplished, making the lamp only 24 inches, by dispensing with the outer globe, and in its place using an opalescent reflecting shade which fastens to the lower part of the casing.

In the Matter of the London Contract.

Negotiations were opened with the British Thomson-Houston Company, Limited, the foreign branch of the General Electric Company, some months ago. Mr. Rice, who is the technical director of the General Electric Company, went abroad a few weeks ago to complete the details of the contract. This is the first heavy electrical work which American electrical manufacturers have been able to secure in Europe. It is believed that it will lead to considerable foreign business of the same character in the near future.

ELECTRIC LIGHT FLASHES.

The Arkansas Legislatute has appropriated $12,000 for the erection of electric plants for lighting the penitentiary, state-house, blind school and insane asylum.

A large number of business men of the city have notified the Syracuse Electric Light and Power Company to "turn off the electricity" until after the electric light company has acceded to the demands of organized labor.

Work on the new dam for the Union Electric Company, in Goffstown, N. H., has begun. The contractors are Kittredge & Son, of Lowell, Mass., and the contract price for work alone is $37,000. The work of setting poles for the new electric light system is progressing rapidly.

Since a boycott has been declared against the Syracuse, N. Y., Electric Light and Power Company, representatives of the trades assembly are making a canvass of the business houses of the city and asking that in behalf of organized labor the electric lights be taken out.

At a meeting of stockholders of the Poughkeepsie, N. Y., Electric Light and Power Company, held a few days ago, the following persons were chosen directors for one year: W. W. Smith, W. R. Maloney, S. A. Crum, J. H. Brinckerhoff, E. P. Platt, O. I. Norris and R. H. Decker. The following officers were elected: President, J. H. Brinckerhoff; vice-president, E. P. Platt; secretary, W. R. Maloney; treasurer, S. A. Crum.

The Hartford, Ct., Electric Light Company will begin the erection of a new building on Pearl street to replace the present one-story building, used formerly as the head office of the Light and Power Company, in a few weeks. When the new building, which is to cost about $8,000, is completed the office of the Hartford Electric Light Company will be moved from State street, and the present quarters in Long's Building will be given up.

A deal has been closed and deeds placed on record by which the Redlands, Cal., Electric Light and Power Company succeeds to the ownership of all the available water power in the valley, and practically acquires a monopoly of lighting contracts. As a result the local gas company has given notice that it will go out of the electric light business and take down its poles. The new syndicate has let a contract for tunneling and canal work on Mill Creek. The work will cost $150,000, and will be completed by January 1, 1898. Three hundred men will find employment.

Favors Electrocution of Certain Vocalists.

[*From the N. Y. Sun.*]

Static electricity modifies the human voice seriously, as MM. Mourtier and Granier report to the Paris Académie de Médicine. A singer sitting upon an isolated stool coupled to the negative pole of a static machine was made to breathe the atmosphere, which was electrified by means of a brush electrode; after a short time the voice became full and clear, the quality much more agreeable, and the voice was less rapidly tired. For some singers a dynamic current of 1,500 volts connecting with the electric chair is the only remedy.

Electrical Review

Times Building, 41 Park Row,

P. O. Box 2339. **NEW YORK.**

EDITOR:
CHARLES W. PRICE.

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STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1646 "CORTLANDT," TELEPHONE CALL.

WESTERN OFFICE:
CARL E. KAMMEYER, Representative,
1627 MONADNOCK BLOCK, CHICAGO.

LONDON OFFICE:
HENRY W. HALL, Representative,
42 OLD BROAD STREET, LONDON, E. C.

News, Subscriptions and Advertisements.

Subscription to the
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - .10

Copies can only be supplied for one year back at 25 cents each.

NEW YORK, JUNE 9, 1897.

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We published last week mention of an exhibit of vacuum tube-lighting given by Mr. D. McFarlan Moore. As we predicted in the ELECTRICAL REVIEW a year ago, the vacuum vibrator has been abandoned; a rotary device is now adopted which we believe will meet the same fate. We do not wish to do an injustice to any worker in the electrical field, but it is our belief that practical and competitive lighting by the Moore system is a problem far from being solved.

ELECTRIC LIGHTING RETROSPECTION.

Twenty years of electric lighting have created a revolution in the manufacturing, business and social world such as was never before known. The advent of the steam engine marked the beginning of an era in history, but its development and introduction were slow and took years of time. The same is true of the locomotive and the steamboat, yet the three did more for the practical advancement of civilization than all prior inventions together. Their influence was enormous in after years, and to-day all know what we owe these agencies for good.

Contrast with their snail-like development the rise and progress of the electric light. Appearing modestly, first, in 1876 in a form approximating commercial requirements it sprung almost at once into general favor, and in the short space of a couple of years it began to shine in all directions. First taken up by manufacturers as an aid to efficient work and cleanliness, in comparison with the miserable dingy torches of yore, it was quickly exploited by local companies formed for the purpose. Millions of capital were risked in the new venture, and then began the wonderful transformation of our nocturnal and diurnal world, the like of which was never seen before.

But our generation is familiar with the giant strides of the electrical industry, and how the germ, modestly shown at the Centennial of 1876, grew and multiplied, till now arc lights run into the millions and incandescent lamps are as the sands of the sea. All this had a marked influence on our business and social life. Dark storerooms and offices were made bright and cheerful, work was made agreeable, dirt was seen and banished. Homes were made cheerful, reading a pleasure, the heat and smell of troublesome lamps and noxious fumes of gas were counteracted, and life in one of its aspects took on a better look. Gloomy and dangerous streets were made bright and safe for the belated citizen, prowlers took to cover, and the new light proved a blessing to the police and a foe to the criminal.

All this splendid work of the light companies and private plant owners produced far-reaching effects in a multitude of directions. Steam engines had to be designed to fit the new uses; improvements were rapidly introduced better to meet the requirements of closer regulation, higher efficiency and lower cost. A new and a prolific field sprung up for the manufacturers, which was quickly shared by boiler-makers, manufacturers of feed-water heaters, injectors, pumps, steam pipes and fittings, and a score more who suddenly had to face an actively increasing demand for their goods—a demand which, after the expenditure of many millions of dollars, seems even now to be ever increasing and never satisfied. Wire drawers had to stir themselves to meet the enormous demand; insulated wire makers found a field worthy of their best efforts, and both these lines of manufacture flourished in a wonderful degree. The makers of belting, shafting, pulleys and hangers all felt the tide of prosperity. Glass manufacturers got a share of new business, gas-fittings shops found new work. Besides all this an entirely new line of industries came into existence, dynamo and lamp factories, insulator works, carbon works, switch makers, and the great progeny of small shops more or less dependent on the electric light industries.

All these were new fields for the machinist, the engineer, fireman, laborer, lineman and a host of other trades and callings, and their employment necessarily had a marked effect on the prosperity of the world.

A natural result of the development of the dynamo and motor came in the guise of the electric railway, and the promoters and developers of electric lighting can claim much of the credit for this great achievement and all its attendant advantages.

A new profession grew up, and electrical engineers to-day stand as high in the ranks as any of their older brethren. Colleges and universities had to expand their *curricula*, and technology in general received a great impetus, until to-day a college course in electrical engineering is as usual as a commercial course in an academy.

With all this to reflect upon, the army of workers who have directly contributed to the advancement of electric lighting in any of its phases has much, indeed, to be proud of, much cause for congratulation, and to the representatives of all the electric lighting and allied interests at Niagara Falls we extend our compliments and say only "Excelsior."

The meeting of the independent telephone companies in Chicago last week was well attended and a business spirit prevailed. The adjourned meeting to be held at Detroit on June 22 is likely to have a large attendance. The resolution passed at Chicago is temperate and indicates the formation of a strong organization to which the companies can generally subscribe.

ABSTRACTS OF PAPERS READ AT THE CONVENTION OF THE CANADIAN ELECTRICAL ASSOCIATION, HELD AT NIAGARA FALLS, MAY, 1897.

"DETERMINATION OF THE HEATING POWER AND STEAM-PRODUCING VALUE OF COALS FROM A PRELIMINARY EXAMINATION," BY WILLIAM THOMPSON, MONTREAL WEST.

A successful station manager takes pride in choosing his generating and distributing apparatus with the greatest possible care, and purchases only that which he considers suitable for his purpose. We all know that there is efficient and inefficient station apparatus, and we all strive to get as far as possible that which we consider will bring us in the greatest return and most efficient service for capital invested. The same principle of getting best returns and most efficient service should, I claim, underlie our system of purchasing our fuel.

Repeated efforts have been made by scientists to construct a formula whereby the actual heating power of coals could be accurately ascertained by computation. Perhaps the most recent and nearest correct formula of this kind that has been given to the public is the formula constructed by Dulong, and more recently by Mahler.

Both these gentlemen based their calculation upon an elementary analysis of the coal under examination. They establish the fact that the heating power of fixed carbon remains constant, as does also that of hydrogen when in combination with the same proportion of oxygen and nitrogen.

To engineers, however, a new difficulty presents itself, since both of these formulas are based upon an elementary analysis, which is not only difficult to make but exceedingly liable to give an inaccurate result, unless conducted by a chemist experienced in this class of work. Consequently we must look for a formula constructed on the basis of a proximate analysis. A proximate analysis merely determines the coals into four sections, and consists of the determination of moisture, volatile combustible matter, fixed carbon, and ash.

M. E. Goutal appreciated this difficulty referred to, and, after reviewing the work of Mahler and others, made a number of calorimetric tests, comparing them with a formula of his own construction, as follows:

$$Q = 14{,}670 \text{ F. C.} + A \times \text{volatile matter},$$

when Q = calorific value of coal.

14,670 = constant heating power of fixed carbon,

A = 23,400 when volatile matter equals from 2 to 15 per cent of total combustible.

A = 18,000 when volatile matter equals from 15 to 30 per cent of total combustible.

A = 17,100 when volatile matter equals from 30 to 35 per cent of total combustible.

A = 16,200 when volatile matter equals from 35 to 40 per cent of total combustible.

The result of this formula seems to come near the actual theoretical value of coals, and may at the present time be taken as a useful formula for the calorimetric value from a proximate analysis of coals of an anthracite, semi-bituminous and bituminous nature, but should not be used in cases where the volatile matter exceeds 35 per cent of total combustible.

For industrial purposes Gruner divided European coals into five distinct classes, according to the quantity of fixed carbon contained in the combustible of each.

Class 1. When the total combustible of the coal was composed of 50 to 60 per cent fixed carbon.

Class 2. 60 to 68 per cent fixed carbon.

Class 3. 68 to 74 per cent fixed carbon.

Class 4. 74 to 82 per cent fixed carbon.

Class 5. 82 to 95 per cent fixed carbon.

TABLE OF INDUSTRIAL VALUE OF COALS,
as per Gruner's classification.

Class.	Fixed Carbon; % Total Combustible.	Volatile Carbon; % Total Comb.	Hydrogen; % Total Comb.	Oxygen and Nitrogen; % Total Comb.	Actual Value in B. T. U.	Industrial Value in B. T. U.	Industrial Value; % of Actual.
5	82.	8.	4.5	5.5	16.560	10.368	62.6
4	74.	14.	5.5	6.5	16.740	10.596	63.3
3	68.	16.	5.	11.	15.840	9.676	61.
2	60.	20.	5.8	14.2	15.300	8.756	57.2
1	50.	22.	8.5	19.5	14.400	7.716	54.6

The adoption of the principles underlying Goutal's formula and multiplying by the average percentage of efficiency of the various classes of coals for industrial steam-making purposes, as determined by Schurer-Kestner on European coals and Johnston on American coals, leads me to the belief that a formula constructed as follows will be of especial benefit in enabling engineers to arrive at the steam-making capacity of their coals:

$$Q = 14{,}652 \text{ F. C.} + A \times \text{volatile matter} \times B.$$

Where A equals 23,400 when volatile combustible is equal to from 2 to 15 per cent of total combustible,

A equals 20,000 when volatile combustible equals from 15 to 30 per cent of total combustible,

A equals 17,100 when volatile combustible equals from 30 to 35 per cent of total combustible,

A equals 16,200 when volatile combustible equals from 35 to 40 per cent of total combustible.

Where Q equals industrial value of coal for steam-making purposes, and where

B equals .64 when fixed carbon equals 82 to 90 per cent of total combustible,

B equals .65 when fixed carbon equals 74 to 82 per cent of total combustible.

B equals .662 when fixed carbon equals 68 to 74 per cent of total combustible.

B equals .588 when fixed carbon equals 60 to 68 per cent of total combustible.

B equals .551 when fixed carbon equals 50 to 60 per cent of total combustible.

With this formula and the proximate analysis before us, we are readily enabled to determine which of two coals is likely to be the most economical and best suited to the conditions under which combustion must take place, and will, I hope, be found useful by my hearers in enabling them to arrive at the real value of any sample of coal placed before them for their examination and opinion.

"ELECTRIC RAILWAYS—HOW TO MAKE THEM A COMMERCIAL SUCCESS," BY C. E. A. CARR.

This is not the time nor the place to discuss the best method for the collection of fares, whether to use a rigid or flexible bond, or whether a single or double truck is best, although these details require a great deal of study, and bear a close relation to the answer to my subject.

Track construction is a subject that has been thoroughly discussed from time to time, and as so many engineers differ as to the best methods, I can only express my opinion as to what forms are best suited under certain conditions. For an electric road in a town or city street, or wherever pavements of a permanent character are used, the girder rail seems to be the only one suitable. The depth of the rail should be not less than seven inches, and should weigh from 70 to 90 pounds to the yard. What the exact weight of the rail should be would depend upon the frequency of the service required, and the weight of the rolling stock to be used. In a macadam or unpaved roadway, a T rail of 65 pounds to the yard is all that is necessary. While it may be better, under certain conditions, to have rails laid in concrete with a permanent pavement, my experience has been that cars rattle and jar a great deal more than when running over a roadbed of less rigidity. In all paved streets, rails should be firmly spiked on oak ties, five inches by seven inches by seven feet, spaced two feet apart. The grade should first be properly leveled, and the whole surface covered with good, coarse gravel six inches in depth. Fish plates or angle bars, three feet long, with not less than six bolts at each rail joint, should be properly fitted and bolted. Soft copper bonds, of sufficient size to carry the maximum return current from any distant part of the line to the power-house, should be properly attached at each joint.

The rolling stock should be the best obtainable, should be well lighted, fitted with signal bells, curtains, and properly heated during the winter season. Keep the cars clean inside and out, and upon the first appearance of dowdyism have them overhauled, repainted and varnished. The appearance of a car is next in importance to the appearance of employés, and very often indicates the prosperity or otherwise of a railway, as the ever exacting public is not slow to give its verdict.

The power-house of an electric railway should be the best obtainable. It should be built near a railroad track, so that coal can be cheaply delivered, and it is very desirable that the site selected should be near a good water supply, so that condensing engines may be used. If these conditions can be had near the center of distribution, a very great saving can be effected in the cost of copper feeders. The building should be a substantial structure of brick or stone, well lighted and fireproof. Direct-connected multipolar generators, with slow-speed, compound condensing engines, will give best results where a moderately steady load is maintained. Where few cars are run, and the fluctuation in load varies from 300 to 400 per cent, a high-speed engine would give better service, as it responds more readily to the varied conditions.

In Canada, where soft coal is used for fuel, the high freight and duty rates make it essential to have boilers of the highest efficiency, without much regard to their first cost. For this same reason, the boiler-room should be fitted with fuel-saving appliances, such as an economizer, heater, stoker, automatic damper, regulators, etc.

It is not enough that we carry our regular customers. These come to us anyway, and it is to these that we look for a guarantee of our operating expense. The profit or success of the railway lies in the margin of how many we can induce to become patrons, and thereby increase the regular revenue. This may be accomplished by various means. The railway company, like any other business concern, has goods to sell, in the way of rides, and no doubt there are times in the day when the manager feels that he is overstocked, and is inclined to put on "Bargain Matinees" to get a full car. He should advertise and let the public know there is an electric railway in town; that its business is to carry people from place to place comfortably and quickly, and that they can't afford to walk; that the time saved in riding will more than pay the fair. There are various ways in which to do this, and methods may be adopted so that the cost is very slight.

One very good way is to issue annually a handsomely illustrated booklet, which contains cuts of all the interesting points touched by the cars, briefly telling how to get there. The different firms supplying the company with materials will advertise for the asking, and the cost to the company is practically nil. This style of advertising is particularly valuable to strangers and tourists. The railway company in London issued just such a little booklet as I mention, about a year ago, and it was a daily occurrence to see a group of strangers taking a ride around the Belt Line with book in hand, pointing out the various public buildings, parks and squares, as the car went along.

Many electric railway companies establish parks at the end of one or more of their lines, and provide amusements in the way of band concerts, etc. Some companies claim to have profited by this departure, while others have an adverse experience. It is more desirable to have the amusements provided by some one who thoroughly understands it, the company making certain concessions in the way of issuing coupon tickets for admission.

The selection of employés has more to do with the success of an electric railway than anything else. Conductors, motormen, inspectors and shopmen have the power to earn or lose money; make the railway popular or odious with the public; keep claims for damages at a minimum or make them a burden, and very often their selection does not receive the care that is exercised in the purchase of ordinary supplies. Every employé should be considered an agent of the company, and should not only be sober and intelligent, but have good judgment and a cheerful disposition. Loyalty to the company he serves should be his first motto.

With the whole army of employés, loyal, faithful and devoted to their duty, gross earnings will steadily increase and operating expenses be at a minimum, and the stockholders would no longer need to ask if the road was a success.

The growing demand of the public for better accommodation and luxury in the matter of travel and speed must be met by giving them better cars, more comfortably furnished and more expensively fitted than heretofore. By supplying these demands, the company will add largely to its revenue.

(To be continued.)

PERSONAL.

Mr. A. L. Reinmann, for years general superintendent of the Sawyer-Man lamp factory, is now general superintendent of De Lavals Svea lamp factories (Glodlampfabrik), in Stockholm, Sweden. It is one of the largest factories in Europe, having a capacity of 10,000 lamps a day. They own their own gas works and glass house.

Mr. George H. Stout, who has been identified with electrical interests since 1880, and spent several years abroad for the Edison company, will represent the Walker company, with headquarters at Cincinnati, Ohio. Mr. Stout had the honor of erecting the first Edison isolated plant in Europe and the second Edison isolated plant in this country.

Type H Transformer.

A type of transformer of new mechanical design and embodying many marked improvements, not only upon those previously manufactured by itself, but also upon those of other manufacturers, is announced by the General Electric Company. It is known as the type H, following the preceding types in alphabetical order, and its novel construction will be understood from the following:

Fig. 1 shows the construction of the core, built up of single rectangular punchings assembled into a rectangular bundle with notched ends. The bundle, compressed under great pressure, is compactly held by a casing of insulating material, around which is wound one-half of the low potential winding, leaving the toothed or notched ends only obtruding. Around this winding is an insulating wrapping, and over it one-half of the high-potential coil is wound. Two such cores and sets of coils placed side by side, with the ends of the cores interlocked into another set of rectangular punchings, complete the interior construction of the transformer. No iron being wasted, a high-grade expensive iron can be, and is used. This would be impossible with the usual wasteful punching, if the transformer is to sell at a reasonable price and still have the very low core losses of the type H. Moreover, in the method of compression of the core and the winding of the copper, no small saving in copper is effected, there being none of the waste space between coils and iron found in the usual transformer. This saving also tends to diminution in the cost price.

Winding the coils upon a tightly compressed bundle of iron gives a practically solid mass without possibility of vibration, either in iron or coils. From the type H is thus eliminated any objectionable "humming" or damage to insulation from constant slight motion of the coils. This is a distinct advantage, and still another is the one cylindrical bounding surface between the primary and secondary, doing away with corners or other surfaces inconvenient to insulate. To form as strong a barrier as possible against a high potential on the secondary, a protective device is added to the insulation. This is the so-called "earth shield," which is simply a sheet of copper placed between the primary and secondary windings and connected to earth. Thus, even should the insulation between primary and secondary become pierced, this grounded shield would prevent any part of the secondary system being at any great difference of potential from the earth, and remove any possibility of danger to life and property due to high potential on the secondary winding.

The usual type of transformer could, with difficulty, only be provided with this shield, while with the type H the addition is both simple and effective. Fig. 2 shows a 10 kilowatt transformer of this type partially completed, the right hand core equipped with its shield and another shield standing in front of it. While the General Electric Company does not provide this shield in standard transformers, it can readily do so when required.

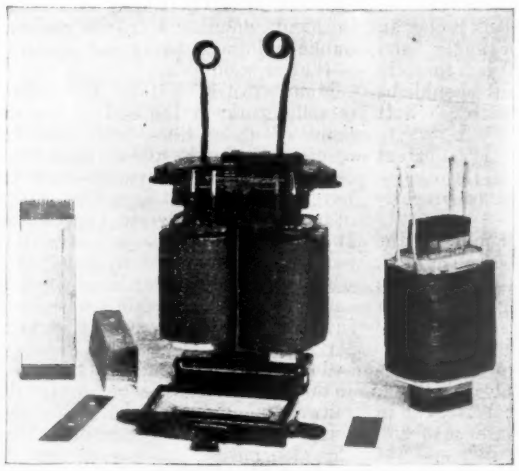


Fig. 1.—Core and Winding of Type H Transformer.

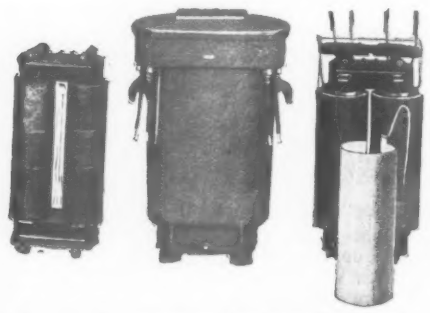


Fig. 2.—Transformer Showing Protective Earth Shield.

Fig. 4.—Transformers Complete, 1,500, 1,000 and 600 Watts.

Fig. 3 is a curve illustrating some of the foregoing facts. All temperatures of the copper were determined by measurements of the resistance of the coils at intervals during the run, and, therefore, denote actual mean temperature of the entire winding. Curve 1 is the temperature of a large size type H transformer; Curve 2 the temperature of the same transformer with the case filled with oil, all type H transformers being in cases designed to be filled with oil; Curve 3 shows the temperature of the oil, while Curve 4 shows the temperature of a well known transformer of the same size but of other make; Curve 5 showing the highest temperature accessible to the thermometer of the transformer, the actual temperature of which is shown in Curve 4.

Fig. 4 shows the careful design of transformer. It is well proportioned; the cover has a deep flange giving a weatherproof joint; the bushings of both primary and secondary leads are of porcelain placed in projecting compartments at the top of the box, which gives protection to the bushing and insures ample distance between primary and secondary. Four secondary terminals are brought through the bushings. The transformer can thus be used interchangeably for either of the two secondary voltages for which it is wound or on a "three-wire secondary" system. A connecting board placed in the case provides for a similar coupling of the two primary coils in series or multiple.

To those interested in looking still further into the construction of this transformer, and the results that have been obtained with it, the General Electric Co. will send, upon application, a copy of a treatise entitled "Use and Abuse of Transformers." This little pamphlet deals broadly with the transformer question much more thoroughly than is common in commercial literature, and is a very attractive specimen of the printer's art.

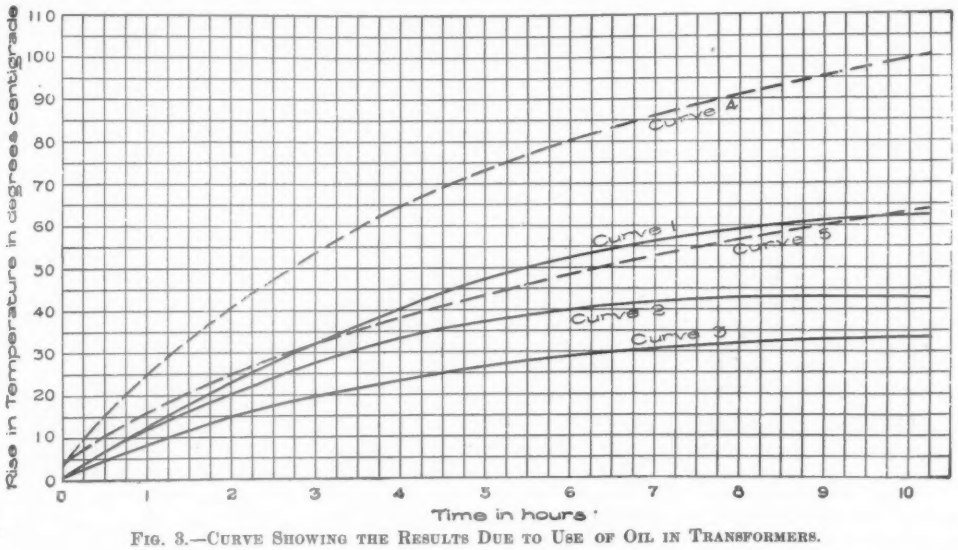


Fig. 3.—Curve Showing the Results Due to Use of Oil in Transformers.

National Automatic Fire Alarm Company.

The above company, with offices at 618 Grevier street, New Orleans, is going into the general electric supply business. They will handle electric light, telephone, and electric house goods supplies, and are putting in a complete line of these goods. Manufacturers are requested to send catalogues addressed to Mr. E. H. McFall, the general manager of the company.

THE LIMITATIONS OF GOVERNMENT IN WATER-POWER PLANTS.

BY MARK A. REPLOGLE.

(Continued from page 265.)

"Capacity of plant for stored energy," the third element to be considered in the government of water-power, is, perhaps, the most important factor, and often receives the least consideration. It is too often a chance factor. The capacity of the plant for stored energy may be easily understood. The following comparison partially illustrates the idea: To reduce the walls of a fortress may require a gang of laborers to use their united energy for several months of time, yet a few hundred pounds of steel, in the form of a projectile, fired from a cannon can in an instant be charged with energy enough to carry it a number of miles, and, at the end of its flight, it yet may retain power enough to reduce the fortress in a moment of time. This principle of storing energy in material in motion is the fundamental principle of all speed government.

If the above cannon ball were forged into a fly-wheel and could be revolved on its axle with such rapidity that its average speed equaled the velocity that it had when fired from the cannon, it would contain the same quantity of energy, and this quantity might amount to many thousands of foot-pounds per second. In speed regulation this stored energy can be used to supply the demands for power until gravity can generate it; in like manner this capacity for energy storage can absorb power when the load has decreased until the power supply can be cut off. It can readily be seen that any and all of the moving or revolving parts of a power plant are store-houses for energy, and their capacity depends upon their weights and velocities. The physical laws governing the quantities of energy under the various conditions are well understood by our scientists and engineers; hence, advantage can be taken of them in the construction of our modern water-power plants.

The careful steam engine builder has learned by experience that he must provide this power-storage capacity in his engine, and he varies it according to what is required of it in government. There is no doubt but that the use of fly-wheels on engines is a result of experience in trying to maintain even speed, and that their prime purpose is to carry any change in load until the power supply from the boiler can be brought into play to carry the new load and to supply the power that the fly-wheel gave out in advance of it. The time required to get gravity effects is always greater than the time required to get the expansive effects of steam therefore, the capacity for power-storage should be correspondingly greater in water-powers if the same efficiency of regulation is required.

The momentum of water-power plants is often very much less than that of steam-power plants, and this lessens the possibilities of government to an extent, determined by the changes in load, the time required for gravity to act and the quantity of power stored in the moving parts of the plant. This factor—power storage—can not be too carefully considered. It is the factor above all others that the designer of a water-power plant can most easily control. It is the one factor that can be varied to counteract all the bad effects of all the others; therefore an intelligent application of it should be made in all water-power plants where good government is important.

The last factor to be considered is the "governor." The governor is often considered to be the most important factor in the government of a water-power; but it is only one of the important factors, and, if it is a perfect machine, it may still be limited in its efficiency by the three above-discussed factors. A good governor can only play the part of an honest judge. Evidences of strife, in the form of changes in load, are placed before it; facts of design and construction are placed at its disposal; the unerring laws of physics are brought to bear upon each new case, and honest judgment is meted out in the form of speed or government of the plant, and no jury or supreme court can set aside the verdict.

A good governor must move the wheel gates as fast as gravity will respond in giving the proper velocity to the increased quantity of water required to supply the demand made for power. If it operates too fast the results are detrimental to good government. The government must have wrought into it the principles that co-operate with the power storage of the plant. It must be so designed and constructed that it will stop moving the gates when they have reached the proper position to supply power for the new condition of load. A good governor must make its judgments quickly and accurately, always returning the speed to normal after correcting the inertia and momentum effects of the change in load. A good governor should also be simple in design and mechanism, otherwise it will be an expensive and unsatisfactory part of the plant. The constant and reliable duty expected of a governor requires it to be a powerful machine; the positive and quick judgments it must make requires it to be sensitive and delicate in some of its parts, and the importance of its position in a plant requires it to be symmetrical in appearance and mechanically perfect in its construction.

The possible regulation in a water-power plant need no longer be a matter of experiment and doubt. The designer of such a plant need no longer be in darkness as to the government of his plant until he has experimented with several governors. He can design his plant for any desired efficiency of regulation, and a properly designed governor can govern it.

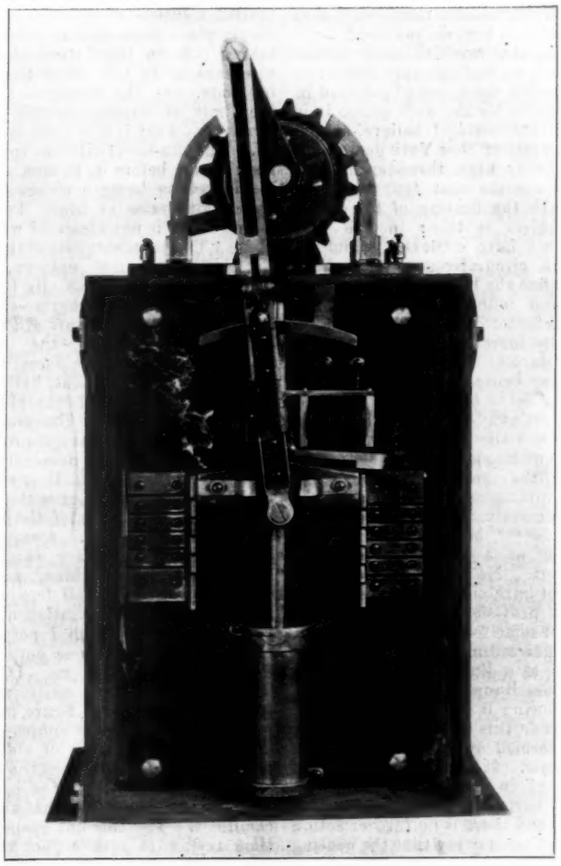
All plants already built are capable of a certain degree of regulation. If this degree is not satisfactory and the figures show that it can not be improved, then further calculations will show positively what changes must be made in order to obtain the desired results.

In conclusion, it should be said that if the limitations of water-power government were investigated more carefully, there would be less doubt concerning the possibilities of government, and no doubt concerning the results in any particular case. Many of our conservative engineers who have not taken time to make these investigations, have still some doubts regarding reliable and automatic government of water-powers; but the results where these limitations have been intelligently calculated and the proper remedies applied, prove beyond all doubt that any desired efficiency of government can be provided for, even to the finest steam engine practice.

The Metropolitan Traction Company, of New York city, has purchased a controlling interest in the Central Crosstown Railway Company. This gives the Broadway line control of the Christopher and East Twenty-third street ferry lines, the Fourteenth street (white) line and the Fourteenth street and Union Square line, and also a lease of the Christopher and Tenth street line. It gives the Broadway road access to a large number of ferries and important transfer points. The existing transfer arrangements which the crosstown company has with the Third avenue cable road will be terminated at the end of 30 days. Transfers will be given at points of intersection with the Metropolitan street railway.

Electric Elevator Controlling Rheostat.

Ever since the first application of the electric motor in direct-connected elevator service, the question of a perfect controlling rheostat and starting switch has caused a good deal of experimenting, and many devices have been tried by the several manufacturers with more or less success. The greatest trouble seems to have been caused by the snap switch, as well as the controlling switch, being subject to burning on opening or closing the circuits, while the discharge from the motor fields also gave considerable trouble. Another serious defect consisted in no provision being made to prevent cutting out of resistance in case of an overload, so that the flowing of fuses was a natural result.



Electric Elevator Controlling Rheostat of the American Rheostat Company—Front View.

The American Rheostat Company, of Milwaukee, has just completed a controlling rheostat for electric elevator service, which it is claimed not only avoids or overcomes the defects mentioned, but contains in addition several improved details of construction which would seem to make the apparatus a practically perfect device for the purpose intended. Our illustration gives a front view of the controller.

The movement of the switch arms and resistance contacts is controlled by a sprocket wheel as shown. The snap switch is double acting, *i. e.*, it snaps either way, and is so constructed that the field discharge is relieved through the arms of the switch, thereby doing away with all injurious sparking. This, the company claims to be a distinctly new feature, the result not having been accomplished heretofore. The mechanical construction of the switch is such that it can not possibly be left in position for arcing. A dash-pot connected to the contact bar prevents the operator from carrying the contact arm faster over the contacts than the adjustment allows. Quite an important feature consists of a controlling, or rather overload, magnet, which, in case of an excess of current through overload or other causes, arrests the motion of the contact carrier, until through a reduction of current the armature has dropped and released contact rod. A latch suitably arranged on contact arm prevents the latter's movement in either direction until the snap switch is positively closed on one side or the other. The salient points of merit claimed for this controller are that it prevents an excess of current from passing into the motor; cuts out entire circuit when elevator is not in use; cuts out circuit without burning; permits reversing of motor without harm; perfectly controls speed of elevator and is constructed throughout in the best possible manner.

ELECTRIC RAILWAY NOTES.

Sarah E. Cassidy, of Halsey street, Brooklyn, N. Y., secured a verdict a few days ago of $2,000 against the Nassau trolley line, for injuries received on a Marcy avenue car last September.

The Toronto Street Railway Company is having quite an anxious time trying to persuade people to use its cars on Sunday. Sabbatarians are numerous there, and announce a bitter opposition to Sunday travel, amounting almost to a boycott, which the company has to offset in some way.

The Metropolitan Traction, New York, earnings in April exceeded $850,000, representing more than 17,000,000 passengers carried in the month. This was the largest April in the history of the company. Sixty-eight of the new open cars were put on the line and 50 of the closed cars were taken off.

The "third-rail" electric railway between Hartford and New Britain has been opened for business, and is operating successfully. President Clark, of the New Haven road, to whom the credit is due for its introduction, expresses himself as much pleased with the results, and seems sanguine that there is a large future field for this type of electric traction.

Steps are being taken at Indianapolis to have the State Supreme Court pass on the constitutionality of the act limiting fares to three cents, which recently the United States Circuit Court declared unconstitutional. Meantime, the Citizens' Street Railway Company does not seem to be worried over the outcome, and is abiding by the decision lately rendered, as also are the patrons of the road, so far.

Mrs. Susan St. John, a New York portrait painter, has been awarded $25,000 damages against the North Chicago, Ill., Street Railway Company. In August, 1895, she was visiting Chicago, and while dismounting from a North State street electric car the motorman started the car before she had alighted, and she was thrown to the curbing. She claimed that her injuries resulted in a tremor which unfitted her for further brush work.

THE DIRECT CONVERSION OF HEAT INTO ELECTRICITY.

ADDRESS DELIVERED BEFORE THE NEW YORK ELECTRICAL SOCIETY, THURSDAY, MAY 20, 1897, BY H. BARRINGER COX.

(*Continued from page 260.*)

After these thermo-electric castings are made we subject them to a bridge test. We make a bridge measurement of it to get the internal resistance when it is cold. Strange to say, these thermo-electric couples, as built, give a current at all times absolutely independent of the fact whether you apply heat or not. There is a difference of potential indicated at all times by a casting of these thermo-electric couples. When we find this natural current in our testing, we offer it in this way: If the current, for instance, is in this direction (indicating), we place a hand in the neighborhood of the casting and bring the galvanometer needle to a balance. If the current is in the opposite direction, we place the hand here (indicating) until we bring the needle to a balance. Now, after we have produced the casting and after we have tested it in the way described, we form the castings up on a spindle and braze the connection of the castings together, using five castings, with a total of 75 junctions, made in five different operations, which take about, I should say, a total of 10 minutes to produce the entire number required. This brings us to the first point in the construction of the machine. We term it a machine. We label this (indicating) as having an internal resistance of so much. After these couples are built up we cement the interior with vitrified cement. When it is all cemented, the plates which have held this built-up device are retained, and it is put in the oven and baked and vitrified. It is then tested again, and all this time it has the tag on it which it started with, which indicates the internal resistance of it when first built up, and the internal resistance of it in the various processes of its manufacture. It started with first being baked in the interior; that is the first baking; then we cement the outside of the machine, bake it and check the resistance again; all bridge measurements, having for their object the substantiation of the fact that the internal resistance has not changed—has not increased or decreased. It is simply to substantiate the original value of these five castings, which go to make up the machine. Now, we have cemented the inside and outside. Then we cement the top and the bottom, and put it through another bridge measurement when it comes out of the oven. If it passes that bridge measurement its jacket of metal is cemented on and firmly joined to it, and it becomes a hard stone cylinder firmly joined to it, and the copper has become so closely connected with it that it becomes an integral part of the cement and of the machine itself.

When we get to this point we conclude, after the machine has gone through all that baking and testing, that it is worthy to be put together in the form of a machine, so we take these bottom and top plates (illustrating) and put one on here—bottom plate here, top plate here—and then we put on this outer cover which forms a water-jacket and solder that on, and when we have done that we make a test under 15 pounds water-pressure for leakage; after the water-pressure has been completed, we submit the machine to heat, slowly applying it, in order to thoroughly vitrify the inside, and then we make final resistance test of the machine; and if the resistance test, after this heat has been applied, corresponds with the resistance test as originally made from the five rows of elements, we conclude that the device is then worthy of being put out and it is then finished. But before it is sold it is always subjected to one week's work. I am not the slightest bit alarmed at the possibility of the fan on the table which is run by one of these machines stopping. Of course, it might. I can not guarantee that, with all our precautions, some machines are going to be defective, but the chances are that that fan is not going to stop revolving. Now, we have brought it down to the completed machine, to a machine such as this (indicating). There is, however, one other point which comes in here, and which you will concede is an important point, and which most people give as the most important point in thermo-electricity—and that is, how much heat do you use?

Taking that machine, as it is running now, we find there are about two and one-half cubic feet of gas used in the machine for the work which it is doing; that costs, I believe, at the ordinary rate of New York gas, which is extremely high, three-tenths of a cent to operate that fan motor per hour. In the heating of the device the problem is this: in the first place, we have a device which is small in circumference, so that we can confine the heat as closely as possible, and following that, we have this deflector (illustrating), which gradually increases in size. It is a simple device. The hottest part of the flame being at the bottom, it is the smallest in the deflector bar, and is furthest away from the sides of the device, and the higher up the flame goes the larger it gets, and the greater the heat is confined the higher up it goes. The device works very efficiently. You may say that the deflector bar, being iron and working at a red-hot heat, will burn out. No; strange to say, it does not burn out, because there is a curious provision of nature, in the shape of some form of carbon deposit, which gas ordinarily gives off when burning as a Bunsen burner, and by using that Bunsen burner the way we do, throwing it on the red-hot disk, this gas or this waste product of the gas is formed on there in the form of a scale. It is what is known as "barfing" in mechanics. This formation barfs this device so that it is coated, and there is no further action on it. You may say that the coating will get thicker and thicker until it will become objectionable. When it becomes a certain thickness it naturally breaks off; especially when the gas is put out, you will hear a snap in the machine, and you will find that little particles of this scale are being broken away. The deflector, even if it was destructible, can be replaced for a very few cents. I know of nothing in the machine, except the deflector, in which there is a question or probability of renewal.

Now, after stating how this machine is made, and how the heat is used, the question is: To what extent have you succeeded in making a practical machine; is it practicable? There is no doubt whatever that it is producing electricity. There is no doubt that it is producing it direct from heat. We see this in the machines on the table. But how far will the device be used? I think the best way will be to show some of its uses. I will operate this six-inch gong, this medical coil, this telegraph instrument and these fans. I think the best way, possibly, to get information on the subject is to have the matter open for discussion. You recognize the fact that this is a commercial device which is on sale, and possibly I am presuming in talking to a scientific body on a device which can be purchased in open market. One of these machines will ring 20 six-inch gongs at one time. It can be used in telegraph work, and has been so used very successfully. It will operate this induction coil, ring the bell and operate the telegraph instrument all at the same time. I will let your own judgment say whether or not the device is valuable. You must remember it is using only two and one-half feet of gas per hour, which costs three-tenths of a cent in New York—in England it would cost about one-half of that.

I do not think my theoretical opinions would be of any value; I have very few. My work is entirely practical. I base my entire life's work on the inch by inch, or sixteenth of an inch by sixteenth of an inch, of daily progress which I can make in the successful solution of a problem; and theory plays little part in the undertaking. As to the future of these machines, as to how large they can be made, are the machines I show the limit of thermo-electric direct converter. I say it is not the limit at all. Thermo-electricity has splendid possibilities before it, so long as it is considered as being a means to the direct conversion of heat. Perhaps my meaning is not clear. I will explain. Thermo-electricity as thermo-electricity, in my opinion, has reached, and did reach, its limit a long time ago. The thermo-electric element reached its limit almost at the time of Seebeck; the couple from an electro-motive force standpoint having been but little improved. The use of thermo-electricity for the direct conversion of heat is simply a mechanical problem, of which one practical demonstration is shown you to-night. It is not the problem of the couple, it is the problem of the utilization of the power which was discovered. Away back, years ago, this discovery was made. I can take that machine, working with that two and a half feet of gas, and by a careful utilization of that gas, by the skill which I possess, I can show you that same output for less than one foot of gas. If I can show you that, you quite readily think, if you stop to figure out the problem, that I could compete with almost any other form of electrical production. I can do it as the result of my personal skill. You can not regulate the machine so that any one can do it. You can not spend your time trying to save a foot of gas. Gas is not the problem in this small machine, except when we come to the larger output it gives. Speaking of the larger output, if I were to use gas, of course, all reductions that I could make in the gas output would be of tremendous importance; but I do not believe gas is going to be used in the larger machines. I have made larger machines, and have seen in them indications of a considerable efficiency, one worthy of serious consideration. I have had machines built exactly on the lines of this, only larger, which produced five 16-candle-power lamps of full photometric value for one cent per hour. What are my ideas in regard to the future of that as a large device? I never believe in trying to improve thermo-electric couples, except mechanically. My idea on the future of the device is to produce an efficient mechanical working device with a very high amperage output and low voltage. I do not attempt to attain extremely high voltage in the device; I do not believe it pays. In all my experiments on thermo-electricity I give, ordinarily, no attention to the thermo-electrical efficiency of a couple, and can tell you nothing whatever about it. I never paid the slightest attention to it. I take this device as it is, overcoming its mechanical defects, and that is sufficient; you are not going to have anything in the immediate future which can compete with it. I am not taking up the problem of the production of a high-voltage couple. I see nothing in it. I aim to produce a very high amperage output in the larger devices, and use some transformer systems to transform the low voltage into higher voltage, utilizing the amperage output instead of attempting to get the voltage. If large machines are made, the field they will occupy you can best judge.

(*To be continued.*)

TELEPHONE NEWS AND COMMENT.

C. H. Willits, of Janesville, Wis., has been appointed manager of the telephone exchanges of the Wisconsin Telephone Company in that city.

The Citizens' Telephone Company, of Ashland, Ohio, announces a reduction of rates to $1.50 a month for business houses, and $1 a month for residences.

A trolley wire crossed a telephone wire at Fort Wayne, Ind., and burned out the entire Home telephone exchange, entailing a heavy loss, and completely wrecking the entire city service. Fifteen men were at work all day straightening out the service.

The New England Telephone and Telegraph Company has just completed erecting a fine new switchboard in the Nashua, N. H., exchange, which is a model of elegance and practical convenience of manipulation. Manager F. L. Towey is to be congratulated on the improvement in service thus provided for.

It is reported that the opposition telephone company at Fort Smith, Ark., which several months ago was purchased by the Southwestern Telegraph and Telephone Company at about 30 cents on the dollar of its cost, is badly entangled in the courts and otherwise, and a clear title has not as yet been given the purchasers.

The City Council, of Utica, N. Y., on May 21, refused the application of the Utica Standard Telephone Company (independent), for an ordinance permitting it to install an independent telephone system in that city. The objections were based, not on opposition to competition and lower rates, but to more wires in the streets, and the consideration that two telephones cost more than one.

Mr. F. P. Fish, counsel of the American Bell Telephone, says with respect to the recent Supreme Court decision sustaining the validity of the Berliner patent:

"It is true that there are some technical defenses regarding the patent which the court did not pass upon. These defenses must be tested by infringement suits which the company will bring, in order that the legal status of the whole question may be comprehensively adjusted."

TESLA'S WIRELESS TELEGRAMS.

Nearly every telegraphic inventor has for years dreamed in his waking hours of the possibility of communicating without wires. From time to time there has appeared in the technical journals a reference to experiments showing the almost universal belief among electricians that, some day, wires would be done away with. Experiments have been made attempting to prove the possibilities, but it has remained for Mr. Nikola Tesla to advance a theory, and experimentally prove it, that wireless communication is a possibility, and a by no means distant possibility. Indeed, after six years of careful and conscientious work, Mr. Tesla has arrived at a stage where some insight into the future is possible.

A representative of the ELECTRICAL REVIEW receives the assurance personally from Mr. Tesla who, by the way, is nothing if not conservative, that electrical communication without wires is an accomplished fact, and that the method employed and principles involved have nothing in them to prevent signals and messages being transmitted and intelligibly received between distant points. Already he has constructed both a transmitting apparatus and an electrical receiver, which at distant points is sensitive to the signals of the transmitter, regardless of earth currents or points of the compass. And this has been done with a surprisingly small expenditure of energy.

Naturally, Mr. Tesla is averse to explaining all details of his invention, but allows it to be understood that he avails himself of what, for the present, may be termed the electrostatic equilibrium; that if this be disturbed at any point on the earth, the disturbance can with proper apparatus be distinguished at a distant point, and thus the means of signaling and reading signals becomes practicable once the required concrete instruments are available. Some years ago Mr. Tesla announced his belief in the possibilities, but he did so only after having satisfied himself by actual tests of apparatus designed by him. Much work had yet to be done, and he has since then given close attention and study to the problem.

Details are not yet available, for obvious reasons, and we now merely chronicle Mr. Tesla's statement that he has really accomplished wireless communication over reasonably long distances with small expenditure of energy, and has only to perfect apparatus to go to any extent. Morse's 40-mile experiment in the old days was on a far less certain basis than the wireless possibilities of to-day.

Tesla's work with high frequency and high-potential currents has been notable. As long ago as 1891 he foretold the present results, both as to vacuum tube lighting and intercommunication without wires. The former had in his hands assumed a condition capable of a public demonstration of the phenomena of the electrostatic molecular forces. Numberless experiments were carried out, and from what then was a startling frequency of 10,000 per second, Mr. Tesla has advanced to what now is moderate work at 2,000,000 *oscillations per second*. Such almost inconceivable results are plainly out of all possible reach by any mechanical rotation of a commutator. And so long as efficiency of lighting is, as Mr. Tesla observes, dependent upon extremely high frequency, it would seem his efforts are in the one and only direction likely, in vacuum tube lighting, to lead to success. Success, according to Mr. Tesla, is already assured, but he will not come before the public until every detail of a practicable and commercial system is complete, and the day for such a consummation, he now states, is near at hand.

OUR CANADIAN LETTER.

CHATHAM, ONT.—The City Council has under consideration the purchase of an electric light plant, authorized by the ratepayers. The cost will be about $15,000.

WINNIPEG, MAN.—Arrangements are now being made for improving the plant of the Gas and Electric Light Company.

RODNEY, ONT.—The town councillors are considering the question of installing an electric light plant.

MERRITON, ONT.—It has been decided to put in an electric fire alarm system, at a cost of $1,000.

PORT HOPE, ONT.—Offers are invited by J. W. Sanders, town clerk, until June 27, for lighting the streets with arc lights or gas lamps.

PORT WILLIAM, ONT.—The ratepayers will on July 9 vote on granting the sum of $13,000 for an electric light plant.

PICTON, ONT.—The ratepayers will be asked to vote a sum of $12,000 to improve the electric light plant.

HAMILTON, ONT.—The Hamilton Radial Railway Company proposes to extend its line to Burlington. Hamilton, Grimsby & Beamsville electric railway will build a station in Beamsville. The Hamilton, Chedoke & Ancastor Electric Railway Company will consider tenders for the construction of a railway to Chedoke.

LONDON, ONT.—The London Street Railway Company will probably build a road to Lucan. The London street railway will extend its line to Pottersburg at a cost of $10,000.

OTTAWA, ONT.—The Ottawa Electric Railway Company will probably place new rails on several streets at a rate of $3,978 per mile.

NIAGARA FALLS, ONT.—A new electric railway company has been formed, composed of H. C. Symmes, R. Paine and others, to construct a line which will connect with the Niagara Falls Park & River Railway and extend to Lundy's Lane battle ground.

WINDSOR, ONT.—Surveys are being made for an electric railway from Amherstburg to Windsor, the plans for which have been filed in Toronto by Mr. Auld, of Amherstburg.

June 5, 1897 J. A. C.

OBITUARY.

Members of the National Telephone Exchange and the National Electric Light Associations will regret to hear of the death of Lewis H. Humphreys, the lessee and manager of the Narragansett Hotel, in Providence, R. I. The above associations held meetings at the hotel respectively in 1885 and 1891, and members will recall the pleasant hours afforded them by the efforts and hospitality of Mr. Humphreys.

THE LATEST NEWS.

Announcement is made of the success of the Hastings process of converting scrap-iron into tool steel, by means of a new converter, using oil as fuel at a very low cost.

The Inclosed Arc Light Company, of New York city, has been incorporated; capital stock, $5,000; directors, Henry Clews, James B. Clews, William H. Acken, John Acken and William H. Perrine, of New York city.

Judgment for $8,655 was entered Saturday last against the Block Lighting and Power Company No. 1 of this city and Malcolm C. Anderson, in favor of the Bank of Saginaw, Mich., on a note of the company, which was indorsed by Mr. Anderson, and for $8,652.

Once a year the trolley cars of Rockford, Ill., are taken charge of and run by the society women. Last Saturday was the second occasion and the Woman's Union Aid Society took charge, and made a social and financial success. They went on duty at 6 o'clock A. M. and off at midnight. Result to the society about $1,000.

It is reported that, with the possible exception of the City Railway Company, the Chicago cable lines will be consolidated under the name of the Chicago Traction Company. The organizers are J. Pierpont Morgan, C. T. Yerks, William L. Elkins and P. A. B. Wineder. The Allen bill, just passed by the legislature, contains a paragraph permitting street railways in any city to pool.

The Second Avenue Traction Company, of Pittsburgh, which controls the Pleasant Valley system traversing Allegheny and part of Pittsburgh, have begun the work of reconstruction of the entire trackage of the latter, using large ties and nine-inch girder rails and everything is to be of the most approved type. New cars are also to be provided and the entire system renovated, and when completed will be among the best in the country.

The Amsterdam Electric Light, Heat and Power Company, the successor and assignee of the State Electric Light and Power Company, of Brooklyn, has been denied a permit to open the street for the purpose of laying conduits. This refusal by Commissioner Willis is based on the opinion of Corporation Counsel Burr that the franchise to build conduits and lay wires is dead by reason of failure to fulfill the conditions of the grant. In all probability the Amsterdam company will carry the matter into court. This franchise was granted to Mr. Cocheu.

Arrest of Secretary Sands of the E. S. Greeley Company.

J. W. Sands, secretary of the E. S. Greeley Company, which recently failed, is reported to be an embezzler of his company's funds to the amount of $65,000. He was arrested, secured bail to the amount of $40,000 and is now in Europe. His defalcations explain the failure of this well known electrical house a few months ago.

CANADIAN ELECTRICAL ASSOCIATION.

CONVENTION AT NIAGARA FALLS, CANADA, LAST WEEK.

The Canadian Electrical Association held its seventh annual convention, at Niagara Falls, Ontario, on June 2, 3 and 4. The attendance was large and the meeting was most successful.

President Yule suggested that steps be taken to secure legislation to protect the vested rights of light companies when a municipality should decide upon lighting with electricity, and a committee of seven was appointed to report upon the matter.

Mr. Mortimer, the secretary-treasurer, then reported the membership to be 163 active and 20 associate, an increase of 54 over last year. The financial condition was equally satisfactory, there being a balance of $415.82 on the year's account.

In the evening the delegates took a trip to Buffalo, where the power-house of the Buffalo Railway Company was inspected.

On the second day, June 3, about 70 delegates assembled. The president's plan before mentioned was approved, and the legislation committee was authorized to raise and expend any money necessary for the purpose.

The election of officers for the ensuing year resulted as follows:

President, Mr. John Yule, manager Guelph Light and Power Company, re elected; first vice-president, Mr. Charles B. Hunt, manager London Electric Company; second vice-president, Mr. J. A. Kammerer, general agent Royal Electric Company; secretary-treasurer, Mr. C. H. Mortimer, publisher *Electrical News*, Toronto, re elected for the sixth time.

Executive committee, Messrs. J. J. Wright, A. B. Smith, John Carroll, F. C. Armstrong, Ormond Higman, F. T. Bowman, W. H. Browne, A. A. Dion and Wm. Thompson.

The legislative committee consists of Messrs. Yule, Reisor, Wright, Farley, Comstock, Hunt, Parker and Pepler; the statistical committee of Messrs. Smith, Wickins and Higman, and the committee on meters inspection, of Messrs. Wright, Powell and Milne.

Montreal was chosen as the meeting place of the association in 1898.

A number of papers were read during the day and will appear in the REVIEW.

The annual banquet was held in the evening at the Dufferin Cafe, about 90 being present, including a number of guests.

June 4th was spent in sight-seeing, the delegates visiting the power districts on the American side of the river.

GREETING.

The ELECTRICAL REVIEW extends a most cordial greeting to the electric light advocates in convention assembled at Niagara Falls this week. May their sessions be highly profitable.

This journal adds a touch of color to its heading this week in honor of the Electric Light Convention.

SUCCESSFUL MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS AT HARTFORD.

MARKED PROGRESS SHOWN IN MECHANICAL DEVELOPMENT—THE ATTENDANCE—PAPERS READ—SOCIAL FEATURES.

The Convention of the American Society of Mechanical Engineers held in Hartford, Ct., May 25, 26, 27, 28, was a meeting of unusual interest because of the large and distinguished body of men in attendance; the excellent papers read, indicating the great strides of progress which are being made in the mechanical sciences; and the cordiality and zeal shown by the local entertainment for the pleasure of the city's guests.

On Tuesday evening, at Unity Hall, Mayor Preston, after an introduction by Mr. Charles E. Billings, president of the Billings & Spencer Company, of Hartford, spoke for the municipality, extending the formal greetings in behalf of the city. President W. R. Warner, of the society, in responding paid a graceful tribute to the genius of Hartford and traced the early history of the formation of the society. Later in the evening a reception was held at which many of Hartford's society ladies were present, as many of the convention visitors were accompanied by ladies.

The following afternoon the Columbia Bicycle Company entertained a large party by allowing a visit to the bicycle shops and an inspection of the new electric motor carriages which this company are constructing. The practicability of the carriages and their perfect mechanical construction appealed very strongly to the guests. Afterwards a visit was made to the Billings & Spencer Company's factory, and the Pratt & Whitney shops. In the afternoon a ladies' reception was held in the parlors of the Allyn House, and in the evening a reception was held by the acting president and faculty of Trinity College.

The entertainment committee were able to have the local street railroad extend the courtesy of their lines to the visiting engineers, and tickets were issued, good for the four days of the session. On Friday afternoon, ex-Senator John Hall took a number of the visitors to Portland on his yacht and a special car at the quarry took the excursionists to the Middletown tracks of the New York, New Haven & Hartford road, thence to Berlin, where a ride on the new three-rail electric system was made. The local committee in charge of arrangements were Messrs. Charles E. Billings, chairman; J. M. Allen, member reception committee; F. B. Allen, C. L. Bailey, A. F. Bardwell, member committee on excursions; F. C. Billings, member reception committee; George M. Bond, member committee on excursions; W. L. Cheny, Meriden; A. S. Cook, C. J. Ehbets, L. C. Grover, member committee on excursions; John H. Hall, member reception committee; J. B. Henney, Charles P. Howard, J. S. Hunter, H. K. Jones, J. P. Lewis, A. M. Lane, Meriden; Edward J. Murphy, Hartford; Charles E. Newton, E. G. Parkhurst, J. J. Peard, T. C. Perkins, F. A. Pratt, F. C. Pratt, A. D. Quint, F. H. Richards, H. W. Smith, Henry Souther, member committee on excursions; W. M. Stone, W. H. Stratton, C. H. Veeder.

A council consisting of a president, six vice-presidents, a secretary and treasurer govern the society. Mr. W. R. Warner, of Cleveland, is the president and the vice-presidents are Messrs. George W. Melville, Washington; Charles H. Manning, Manchester, N. H.; Francis W. Dean, Boston; E. S. Camp, Philadelphia; S. T. Wellman, Cleveland, and W. F. Draper, New York. The nine managers who are at present in office are Messrs. John C. Kafer, New York; Charles E. Bauer, Springfield, Ohio; Arthur C. Woolworth, Boston; Norman C. Stiles, Middletown; Col. E. D. Meier, of the Heine Boiler Company, St. Louis; George W. Dickie, San Francisco; H. S. Haines, Atlanta; G. C. Henning, New York, and A. Wells Robinson, Milwaukee. The present treasurer is Mr. William H. Wiley, of New York. The meetings of the society are held twice yearly, the Autumn meeting always being held at the society's home in New York and the Spring meeting in some city other than New York.

The following unusually valuable papers were read during the meeting, some of which were published in the ELECTRICAL REVIEW last week, and the publication of others of them will follow:

Forest R. Jones, "Diagrams for Relative Strength of Gear Teeth;" F. J. Cole, "Experiments in Boiler Bracing;" De Volson Wood, "Adiabatics;" Frederick A. Bedell, "New Form of Transmission Dynanometer;" R. S. Hale, "Fuel Gas Analysis in Boiler Tests;" R. C. Carpenter, "Hygrometric Properties of Coals;" Charles H. Benjamin, "Electricity vs. Shafting in the Machine Shop;" D. C. Jackson, "Electrical Power Equipment for General Factory Purposes;" Francis Shumann, "Volumnar Contraction of Cast-Iron;" W. S. Aldrich, "On Rating Electrical Power Plants Upon the Heat Union Standard;" A. L. Rice, "The Laws of Cylinder Condensation;" H. A. Hill, "Tests of Sulzer Engines;" H. M. Lane, "Method of Accounting to Determine Shop Cost and Selling Price;" Leonard Waldo, "History and Development of the Bicycle;" R. C. Carpenter, "Tests of Centrifugal Pumping Engines at Sewerage Station at Chicago and Calibration of Large Weir;" John H. Barr, "Current Practice in Engine Proportions;" Thomas Gray, "A Continuous Steam Engine Indicator;" A. K. Mansfield, "The Best Load for Compound Steam Engine;" Gus C. Henning, "A Pocket Recorder for Tests of Materials;" Thomas Gray, "The Effect of Alternate Positive and Negative Stresses in Iron and Steel;" Thomas Gray, "The Yield Point in Iron and Steel;" D. S. Jacobus, "An Apparatus for Accurately Measuring Pressures of Ten Thousand Pounds Per Square Inch and Over;" D. S. Jacobus, "Tests to Show the Influence of Moisture in Steam on the Economy of a Steam Turbine."

The convention was pronounced a most successful one in every way, and it is estimated that about 400 active members were present.

The Cincinnati Edison Electric Company has voted an increase of capital stock, and will purchase a site and erect a new power station on a large scale. The present plant will be abandoned. It is expected the new plant will be ready for service next January.

ABSTRACTS OF PAPERS READ AT THE HARTFORD MEETING (MAY, 1897) OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

(*Concluded from page XVIII of June 2.*)

"ELECTRICAL POWER-EQUIPMENT FOR GENERAL FACTORY PURPOSES," BY DUGALD C. JACKSON, MADISON, WIS.

A perfectly natural extension of the electric power service, in shops equipped with electric power circuits for cranes, gradually came about, and stationary motors furnishing power in isolated corners or places difficult to reach by the usual methods of power transmission became no unusual sight. Motors also gradually came to be used in places where small units of power could be applied temporarily with advantage, as in fitting and finishing.

This gradual growth has brought us to a time when many large establishments find it of actual advantage to throw away—and are throwing away—not only old-style power transmitting machinery for cranes, but the entire power transmitting equipment of their factories, and to replace it with new electrical power equipment for supplying power to be used in the general purposes of manufacturing; while in a remarkable proportion of new establishments main shafts are unknown from the start, their place being taken by inconspicuous and inexpensive electric wires. I have endeavored for several years past to keep records of actual results with electrical factory equipments for the purpose of getting at the real facts. In this paper I purpose to give a summary of the more recent results, and to give at the same time a *résumé* of the views held in a number of the great manufacturing establishments where experience has been had with electrical transmission and distribution of power. In a considerable proportion of these establishments electric power transmission has been used side by side with the mechanical transmission of power from the prime mover to the operating machinery. It is to be understood that I deal specially with the conditions which exist in establishments owning and operating their own complete and independent power plant, and, moreover, that I have excluded from consideration all data relating to electric transmission-plants in the manufacturing establishments of the electrical companies. There are half a dozen such plants, several of which are very large, from which excellent results have been obtained.

Typical list of ten concerns owning plants with over 500 horse-power capacity in electric motors, in their power equipments:

Ohio Steel Company, Johnson Company, Carnegie Steel Company, Apollo Iron and Steel Company, Cambria Iron Company, A. & P. Roberts Company, Baldwin Locomotive Works, Westinghouse Machine Company, Whitman & Barnes, Silver Springs Bleaching and Dyeing Company.

Several of the plants included in this list are using over 1,000 horse-power in capacity of electric motors.

It will be noticed that this list is largely made up of concerns in the iron and steel industries, and which consequently manufacture a heavy and bulky product.

Electrical power arrangements are equally convenient and efficient, whatever may be the shop arrangement, and they lend themselves to many desirable shop arrangements, which can not be approximated where the old-style inflexible systems of distribution are in use. The electric motor and the electric wire may be used just as efficiently under the conditions required for economical handling of the work in a steel mill or locomotive works as in an agricultural works, a spinning mill, a wholesale drug factory, a printing establishment, or a general manufacturing establishment.

The list given above might be considerably enlarged; and if we included establishments that have thrown aside their old power arrangements for the purpose of taking advantage of electrical power generated at a more or less distant water-power, the list could be greatly extended.

Typical list of ten concerns owning plants with from 100 to 500 horse-power capacity in electric motors, in their power equipments:

Wells & French Company, cars, etc., Chicago; Crane & Breed Manufacturing Company, supplies, Cincinnati; Deering Harvester Company, agricultural machinery, Chicago; National Cash Register Company, cash registers, etc., Dayton; Wm. Wharton, Jr., & Company, street railway track, Philadelphia; Brooks Locomotive Works, locomotives, Dunkirk; Parry Manufacturing Company, carriages, etc., Indianapolis; Aultman & Taylor Machinery Company, boilers, Mansfield; Parke, Davis & Company, manufacturing druggists, Detroit; Stanley Works, hardware, New Britain.

This list I have chosen in order to illustrate the wide range of products that are manufactured by electrically driven machinery. The list could be readily increased in length to a degree which I am sure would quite astonish nearly all who listen to this paper. Let me add that in each concern represented on the list the electrical apparatus is used for general power service in the establishment (*i. e.*, it is not confined to any peculiar branch of the power service, such, for instance, as crane service).

The experience, taken as a whole, in all the establishments from which I have been fortunate enough to receive information, shows that for plants, using not less than 100 horse-power, the electrical transmission is so much more satisfactory and economical that it is a misfortune for a new manufacturing plant, except under very exceptional conditions, to be constructed with any type of transmission except the electric. It is to be understood that the electric equipment should be such that crane motors can be operated from the generators and transmission wires which are laid down for the regular factory power distribution, and, for the best results, the generator should also be adapted to the purpose of factory lighting. These conditions are fulfilled by either a 220-volt continuous-current system, using compound-wound generators, or by a properly designed polyphase alternating-current system. In the average manufacturing establishment, the former seems to promise the better results, though more experience with the latter may prove it to give equally satisfactory results. The 220-volt continuous-current plant allows the use of 220-volt incandescent lamps connected directly between the positive and negative transmission wires, or arc lamps may be used in sets of four.

"ON RATING ELECTRIC-POWER PLANTS UPON THE HEAT-UNIT STANDARD," BY WM. S. ALDRICH, MORGANTOWN, W. VA.

The progress of power-plant engineering has reached such a stage of development that electric-power plants should be contracted for on a somewhat similar basis of guaranteed performance as that now in vogue for

pumping plants. There should be guaranteed a definite output, in the case of the electric plant, to be measured at the switchboard and expressed in kilowatts, per 1,000,000 B. T. U., supplied to the steam used in the whole plant.

Following are some of the advantages of having such a standard for this purpose founded upon the heat-unit basis:

(B. T. U. Input.) The computation is based upon the quantity of heat required to raise all of the feed water from its temperature to that of the steam at the boiler pressure, with such additional determinations and allowances as are now regularly made in obtaining the similar quantity of heat supplied in the duty trials of pumping engines.

(Kilowatts Output.) The work is obtained from corrected voltmeter and ammeter readings, at the switchboard, for a definite interval of time at a given specified load, which is maintained uniform throughout.

The present way of stating such performance is: *a* kilowatts per pound of coal; *b* kilowatts per cubic foot of gas; *c* kilowatts per gallon of oil—according to the kind of heat engine furnishing the motive power for the plant. The proposed standard is superior to such ratings as the latter, and furnishes a common, practical and scientific one for all of them. They involve the efficiency of the boiler, or of the gas producer, and this last requires the determination of the thermal value of the fuel.

Efforts are being continually made to obtain such ratings for existing electric-power plants as will enable the probable performance of similar projects to be predetermined when installed and operated in like manner. Sufficient and reliable data may be obtained at various proportional parts of the full load of the plant as will enable one to determine what may be called the characteristics of the particular type of electric-power plant under consideration. The inherent advantages of each type of plant will then appear in its characteristic curves, showing the variations in its efficiency and economy at various proportional parts of its full load or rated normal capacity. Then it will be possible to compare, at different loads, system with system and plant with plant. Such determinations and comparisons will be all the more valuable if based upon commonly accepted standards and ratings, such as the heat unit proposed.

The engineering precedent which will be established by such a standard will promote the predetermination of the efficient and economic performance of electric plants quite as much as similar ratings have accomplished for pumping plants. While both units are rarely built by the same concern, as in the case of the latter, still this should not debar the installing engineer from advocating the use of such guarantees based on the heat-unit basis if his work is to hold its own in the light of the guarantees and contracts made in other branches of engineering, and notably so in the installation of pumping machinery.

The power plant is an aggregation of units and of an ever-increasing complexity. It is therefore quite as essential to have the whole system economically arranged as to have the most economical units. It is this economy of arrangement or of installation, so to speak, which, in a measure, the duty of a pumping plant so clearly expresses when based upon the heat-unit standard. It is such a method of stating the final outcome of the arrangement of all of the details of a power plant of which designers, builders, managers and owners wish to know the value.

Builders of both engines and dynamos are equally interested in the adoption of some such common standard. Unfortunately, however, in many cases. this interest extends only so far as the economic performance is concerned of the individual machines which they manufacture.

Contract trials of the completed plant are necessary to establish the guarantees of satisfactory fulfillment of contract as to both efficiency of installation and economy of operation. The present method of basing the performance of such upon the final plant efficiency is misleading. In electric installations, particularly, there is a set of conditions insuring a maximum value for such an efficiency, usually at some fractional load. There is also in such plants another set of conditions, at some other load, insuring maximum economy of operation of the engine. Only contract trials for definite periods of time, at specified and uniform loads (at various proportional parts of the full load), will enable all claims to be adjusted regarding guaranteed efficiency or economy, when such is based upon the quantity of heat supplied to the system in thermal units.

The business of power-plant design, construction, installation and management, is not altogether in a formative period. Nevertheless, when an electric-power plant can be contracted for on the basis of so many kilowatts output per 1,000,000 B. T. U. in the steam supplied to the plant, and that at a certain specified load, or proportional part of the full load, then we may expect somewhat the efficiencies, economies, guarantees and contracts, now being regularly realized in some of the other lines of power generation.

FIG. 1.—THE BULLOCK ELECTRIC MANUFACTURING COMPANY'S LINE SHAFT MOTOR.

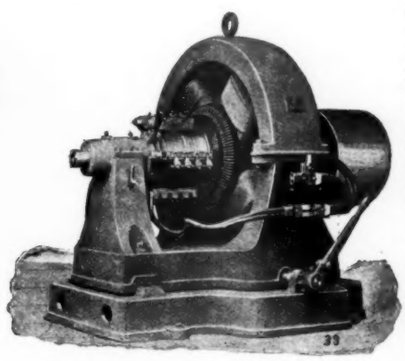


FIG. 2.—NEW BULLOCK GENERATOR.

Association of Railway Telegraph Superintendents.

The sixteenth annual meeting of the Association of Railway Telegraph Superintendents will be held at the Cataract House, Niagara Falls, N. Y., June 16 and 17, 1897.

Several papers on topics of interest to railway telegraph men will be read and discussed. Suitable room for exhibits has been secured at the hotel. A large attendance is expected.

A scheme is on foot to run Kansas City, Mo., steam plants, manufactories, street railways, etc., by electricity, to be generated at Leavenworth, Kas., where fuel can be obtained cheaply, as there are many extensive coal mines there. In addition, it is proposed ultimately to construct an electric railroad between the two cities. Already arrangements to construct a $1,500,000 power plant at Leavenworth have been made. The scheme is headed by Col. D. A. McKibbon, Maj. John M. Long, Harvey M. Rush, George W. Kirkstead and ex-Senator Caldwell, of Leavenworth. Western capitalists are also interested, it is said.

The Bullock Apparatus.

The Bullock Electric Manufacturing Company, of Cincinnati, Ohio, which has taken over the business of the former Card Electric Motor and Dynamo Company, have brought out a type of motor for which there should be a wide field of usefulness. It embraces a series of line-shaft motors for direct connection to the end or any other part of a line of shafting in a shop. These motors are attached to the ceiling or hung from the beams just as the ordinary shaft-hanger is, and are coupled to the shafting by special jaw couplings. Many shops are so equipped with a large number of tools requiring each but a small amount of power, making it impracticable to install a motor for each. The best practice then is to drive each line shaft with a direct-connected slow-speed motor, the only transmission belting used being that from the line-pulleys to the countershafts of the tools. This eliminates all the awkward and inefficient belts running up from floor to floor and from shaft to shaft across the shop, and gives great flexibility of system in operating the tools.

The illustration shows this type of motor in position, a compact, strong and well-designed machine. The brushes are fixed and the motor is noiseless and sparkless, and the load may vary within wide limits without preventing perfect regulation. Common speeds for line shafting are from 100 to 180 revolutions per minute, but ordinary high-speed motors must be belted suitably for such reduction from their normal speed, which may be about 1,000 revolutions per minute. The Bullock direct-connected motor, however, is constructed for the normal speeds ordinarily adopted on line shafting, and, owing to the design and construction required for such low speed, they have a greater reserve capacity for starting and overload than high-speed motors of similar rated power. The usual advantages of low speed as to life, lubrication, temperature and capacity are maintained.

The Bullock company has also a complete line of 1897 generators and motors for both belted and direct connection, ranging in capacity from 1 to 150 kilowatts, one of which we illustrate herewith. While adhering to the best mechanical practice, these motors are especially designed for sparkless operation and low temperature. Laminated wrought-iron pole pieces, ventilated and separated field coils, iron-clad armatures of laminated charcoal iron, well ventilated, and adjustable carbon brushes characterize all Bullock machines. All motors and generators have to submit to a rigid shop test which require sparkless commutation with fixed brushes under instantaneous load changes of 50 per cent.

The Bullock Electric Company is enjoying a good trade in this country, especially in printing establishments, and also has a promising export business. They have an office in New York in the new St. Paul Building, in charge of Mr. R. T. Lozier and brother, Mr. A. M. Lozier.

Electro-Capillary Light.

Herr O. Schutt, of Jena, describes a new electric discharge phenomenon, which he terms Electro-Capillary Light. When the discharge of an induction coil is sent through a narrow capillary tube of about 0.05 millimeter in diameter, provided with aluminum or copper electrodes and filled with air under ordinary pressures, an intense luminosity of the thread of air is obtained— a luminosity which is intrinsically far superior to that of the arc, and would form an exceedingly powerful source of light if it could be made continuous. The narrow capillariesdeteriorated rapidly, roughening inside, and were blown into a series of spherical enlargements. Wider tubes gave less light, but were much more permanent. At the same time the bright lines in the continuous spectrum in the original light became more prominent. At pressure above one atmosphere the phenomena were nearly the same, but the sparks passed with greater difficulty. At low pressures the light became less intense, the continuous spectrum faded, and the bright lines shone out more distinctly. The kind of glass is immaterial. It is stated that the tubes may be made 20 centimeters long, and make splendid line sources.

Contracts are said to have been let for the following equipment for the new power station of the South Side Elevated Railroad, Chicago: Eight Babcock & Wilcox boilers having each a nominal horse-power of 500 and 4,000 square feet of heating surface. The Babcock & Wilcox chain grate will be used, and the boilers will have wrought steel headers; four Allis cross-compound condensing engines, each rated at 1,200 horse-power, but capable of developing a maximum of 2,000 horse-power. The Westinghouse Electric and Manufacturing Company, of Pittsburgh, Pa., will furnish four 800-kilowatt direct-connected generators. The voltage at the terminals will be 650 volts.

ADVANCE INFORMATION

Electric Light and Power.

HENDERSON, MINN.—The question of establishing an electric light plant at this place is again being agitated.

BEAVER VALLEY, WYO. — The Beaver Valley Electric Gas Company has filed articles of incorporation with the Secretary of State. The concern has a capital of $1,000,000, and will carry on business in Wyoming, with a head office in Cheyenne.

MILAN, TENN.—Contract has been signed for waterworks and an electric lighting plant for this place. The contract for the plant has been awarded to C. K. Sherman, of Memphis. The plant will be owned and operated by the town corporation.

GREELEY, COLO. — The Greeley Power and Light Company has been organized by the election of the following officers: President, H. C. Watson; vice-president, James Tuckerman; secretary, William Boomer; treasurer and manager, William Mayher. The manager was instructed to put the plant in first-class order, and to insure a first-class light service for this city.

ELDORA, IOWA—Postmaster W. S. Porter has purchased the Eldora electric light plant for $22,500.

MADISON, WIS.—Darlington Electric Light and Power Company has been incorporated. Capital, $20,000. Incorporators: Frank S. Walker, T. H. Earl and J. B. Canterbury.

BLACK RIVER FALLS, WIS.—R. G. Mason has purchased of R. C. Foster, of Cleveland, the electric light plant in this city.

HOPKINSVILLE, TENN.—The Hopkinsville Water, Light and Power Company has been purchased by F. W. Gilbert and John Leslie.

CASSELTON, N. D.—Address City Clerk concerning erection of electric light plant.

MINNEAPOLIS, MINN.—City Clerk may give information concerning establishment of electric light plant.

CEDAR FALLS, IOWA—A new electric light company has just been incorporated, with Roger Levitt, cashier of the First National Bank, as president.

OCALA, FLA.—The Mayor may be addressed concerning contemplated erection of electric light plant.

MILLEDGEVILLE, GA.—Chas. Wheeler may give information concerning erection of new electric light plant.

CHESTER, S. C.—James McLarnon, secretary public works commissioners, may be addressed concerning proposed electric light plant.

BROOKHAVEN, MISS.—Luther C. Harvey and C. M. McGrath have closed contracts for complete machinery equipment for an electric light plant.

GLENDORA, CAL.—Crystal Lake Irrigation and Power Company has been incorporated. Directors: D. Dawson, H. G. Baker and others. Capital stock, $250,000. The company is to do a general business in handling water and electrical power.

BALLSTON SPA, N. Y.—The Ballston Spa Light and Power Company has been incorporated. Capital stock, $35,000. Directors: Stephen C. Medbury, Harvey J. Donaldson, John S. Butcher, Herbert C. Westcott and Neil Gilmour, of Ballston Spa.

BELLAIRE, OHIO—John McGraw, the contractor, of this city, has received the contract to erect the electric light plant at McMechen. Work will begin on it immediately.

New Electric Railways.

MILWAUKEE, WIS.—Contracts have been let for a second system of electric railway in this city, comprising 100 miles of road, beginning at Waukesha and going through the city to the northern suburbs. William S. Reed & Company, of Chicago, secured the contract. The system calls for an outlay of $2,500,000. It is generally understood that ex-Senator Calvin S. Brice is putting up the money, and will float the bonds when a favorable opportunity occurs.

TAMAQUA, PA.—The Tamaqua & Lansford Street Railway Company has commenced the construction of their road which will connect this place with all towns in the Panther Creek Valley.

BAXTER SPRINGS, KAS.—An electric railway is to be built between this place and Galena.

ST. LOUIS, MO.—A franchise has been granted to the Wellston, Creve Coeur Lake & St. Charles Railway Company for the construction and operation of an electric railway from the limits of St. Louis over the St. Charles rock road to a point on the Missouri River opposite St. Charles. The company is required to commence the construction of the road within six months and to complete it within two years.

CAMP COMFORT, VT.—The Bennington & Woodford Electric Railroad Company is extending its electric line from this place, four and one-half miles from Bennington, to Glastenbury, making a line 10 miles long into the mountains.

ST. LOUIS, MO.—The Delmar Avenue & Clayton Railroad Company has secured a franchise from the county court for an electric railway line from a point on Delmar avenue to another point in the suburbs.

PORTSMOUTH, VA.—The White-Crosby Electrical Company, of Baltimore, has secured contract to build trolley line between Portsmouth and Port Norfolk, which will be three miles long.

CLAYTON, MO.—A franchise has been granted to the Wellston, Creve Coeur Lake & St. Charles Railroad Company, permitting it to build and operate an electric road from the city limits on the St. Charles rock road to a point on the Missouri River, opposite St. Charles, with a branch line to Creve Coeur Lake. The new company will co-operate with a company in St. Charles that has secured a franchise for a bridge across the Missouri at that place.

BOSTON, MASS.—A plan is said to be under way for a belt line of electric roads through North and South Salem.

FRANKFORT, KY.—The Crescent Springs & Erlanger Electric Street Railway Company has filed articles of incorporation with the Secretary of State with $10,000 capital and headquarters at Ludlow. The road runs from Ludlow through Bromley and Crescent Springs to the southern limits of Erlanger, a distance of seven miles. The chief incorporators are John Graf, R. H. Crisler, J. C. Keck, J. A. Seissinger, Jesse and Mount Green and John Walton.

LYONS, N. Y.—The Lyons & Sodus Bay Electric Railroad has applied to the Board of Trustees at Wayne for consent to build an electric road through some of the principal streets of Wayne. The incorporators include G. W. Knowles, William S. Gavitt and Daniel Moran.

MCDONALD, PA.—The Carnegie, McDonald & Canonsburg Electric Street Railroad will connect Carnegie with Walker's Mills, Greggs, Oakdale and McDonald, making in all a line 16 miles in length.

MCKEESPORT, PA.—The McKeesport, Monongahela & Finleyville Street Railway Company was chartered at Harrisburgh on May 20 with a capital stock of $10,000. The line is to run along the river road near Dravosburg, through Mifflin and Jefferson townships to Monongahela borough, with a branch to Finleyville. President, J. L. D. Speer; directors, J. L. Moore, M. N. Bunting and others.

NEPTUNE CITY, N. J.—The Atlantic Coast Electric Railway Company has made application to the borough council for a franchise to build a road through Main street in Neptune City, the new line to parallel the track of the Ocean Grove & Belmar Electric road.

PITTSBURGH, PA.—The West End, Mt. Washington & Bankville Street Railway Company, of Pittsburgh, was chartered May 20 with a capital of $12,000. The line will begin at a point on Woodbine avenue and run to Virginia avenue and Kearsage street. President, John C. Reilly; directors, T. S. Bigelow, W. J. Burns, E. S. Reilly and others.

LONDON, ONT.—The London Street Railway Company will extend its line to Pottersburgh at a cost of $10,000.

New Telephone and Telegraph Companies.

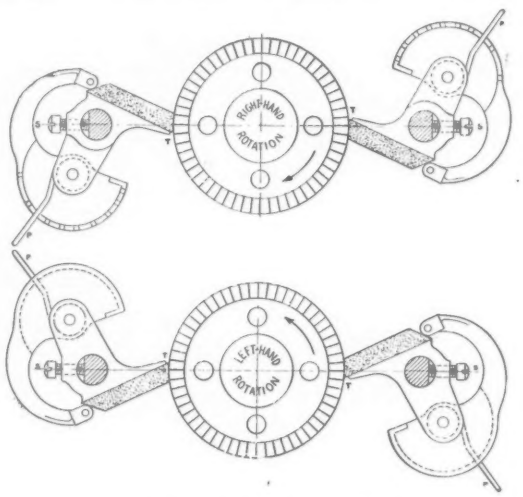
FOXCROFT, ME.—Buck Brothers, of this place, have contracted to build a telephone line from Guilford Village to the woolen mills of the Dews Woolen Company, at North Dexter, thence to Dexter Village.

CHARLESTON, S. C.—The Fountain Inn Telephone Company has been incorporated by S. S. Knight, J. A. Cannon and H. L. Shaw. Capital stock, $800.

BIENHEIM, S. C.—The Matheson Telephone Company has been incorporated with A. J. Matheson, president; Julian J. Matheson, secretary and treasurer, and the officers, with John Evans, are the directors who propose constructing a telephone line between Bienheim and Bennettsville.

The C & C Reaction Brush-Holder.

The new principle brush-holder now being first used by the C & C Electric Company, New York, on this company's new design of machines utilizes the tanquential pressure of the commutator on the brush, which greatly reduces the tension on the brush and also the necessity of holding it laterally. The brush-holder and brushes are of approved form and workmanship and the tension on the brush can easily be adjusted. It is adapted to the carbon type of brush and each brush when in place is independent of the others. The brush, having both ends beveled, rests on a flat surface, and is forced down by means of a curved arm actuated by a spring. Carbon brushes of different widths and thicknesses may be used with the same holder and the brushes may be shifted or replaced with great facility. The holder operates equally well in either direction, being therefore perfectly adapted for reversing motors.



C & C TYPE REACTION BRUSH-HOLDER.

B. & O. SUMMER BOOK.

The Baltimore & Ohio Railroad has just issued a very handsome book for Summer travel, describing the mountain resorts springs and baths located on and adjacent to its lines; also the various watering places on the Atlantic Coast. The routes for reaching them are set forth in a comprehensive and clear manner. The book is printed on fine paper, beautifully illustrated, and will prove of valuable assistance to parties contemplating a Summer tour.

Copies can be had by applying to various B. & O. Agents or by sending 10 cents in stamps to cover postage to J. M. Schryver, General Passenger Agent, Baltimore, Md.

Sales of the "P & B" Insulating Specialties.

Even in view of the claims of other manufacturers the P & B insulating compounds, made by the Standard Paint Company, of New York, according to a remark made by general sales agent F. S. De Ronde, is being used more extensively to-day by electric light companies and electric street railroads than ever before. The claims of the Standard Paint Company are not based simply on what they may think of their goods but upon over 10 years of actual experience and practical tests of others. The P & B compound is considered by hundreds of experts as without a peer for all general insulating purposes.

Old and defective cables, which are apparently worthless and worn out, may be restored and made almost as good as new by the timely application of P & B tape and compound. A short time ago the New York Central Railroad Company insulated several miles of cable, which they were about to throw away, using the P & B products, with the result that the cables were restored almost to the original condition.

The varnish made by this company also for armatures and field coils is strictly of the highest grade. It is a material that does not need baking, is proof against oil, and is made of the very highest ingredients. It is not cut with cheap wood alcohol, as the low grade varnishes offered must necessarily be from the price at which they are sold.

In proof of these claims the company are willing to send a generous sample of any of the P & B products when requested, and correspondence from central station managers, electricians and electrical manufacturers is invited. The Standard Paint Company are also making a specialty of a new water paint for coating walls. This material is known as "Magnite." It is very easy of application, and is sold at a surprisingly low figure. Color card of this material and price list will be gladly furnished on application.

Test of Relative Value of Automatic Circuit-Breaking Apparatus.

Through the courtesy of the Edison Electric Illuminating Company and under the New York company's auspices a test was made June 2 and 3 in the Duane street station of the various forms of circuit-breaking apparatus. The following companies gave an explanation of their respective apparatus, and also showed it in practical operation:

Automatic Circuit Breaker Company, Newaygo, Mich.; American Rheostat Company, Milwaukee, Wis.; C & C Electric Company, New York; Crocker-Wheeler Electric Company, New York; Cutler-Hammer Manufacturing Company, Chicago; American Electric Heating Corporation, Boston; Ward Leonard Electric Company, Hoboken, N. J.; Excelsior Electric Company, New York; General Electric Company, Schenectady, N. Y.; Cutter Electrical and Manufacturing Company, Philadelphia.

The demonstrations were made under the personal supervision of Messrs. Arthur Williams, of the inspection department, and J. Van Vleck, construction engineer, both of the Edison company. The Board of Fire Underwriters was represented and took careful notice of the efficiency of the several types of apparatus, with the view of its indorsement.

In conducting the tests, the points to be shown were as follows: 1. Features for breaking current, as this is the prime object. 2. Breaking circuit in case of current interruption. 3. Overload test for breaking current by short-circuiting the motor.

Mr. Ward Leonard suggested a fourth test to show the operation of the circuit breakers under the weakest possible current. This suggestion was not acted upon, as the brake used on the operating machine was not adapted for it.

An Electrical Planked Shad Dinner.

Mr. Charles E. Trump, the president of the Novelty Electrical Works, of Philadelphia, annually gives a planked shad dinner to some of his New York friends. A specially large net full of this sweet-tasting fish was hauled in last week and his friends arrived in time, and after eating six servings began to lose their appetites—for food. The dinner was given at Washington Park, and the opinion was unanimous that better shad better cooked had never been eaten, and the host was cordially toasted and wished many "returns of the day."

Improvement in Business.

We take pleasure in adding our corroboration to the opinion of the Hon. Russell Sage, than whom no one is more competent in such matters. *There is a revival of business*, not great as yet, but decided. And our opinion is not based upon hearsay or information, but upon solid facts. The weekly settlements of *The Sun* are now for the first time showing an increase in profits over the corresponding weeks of 1896; and there is no other indication of the general condition of business so positive or so unequivocal as the accounts of a great, popular, cash-paying and cash-receiving newspaper.—*N. Y. Sun.*

In *Dun's* review it was stated last week that the business revival was greater than generally realized, and that comparisons were made with previous values instead of the actual volume. Cincinnati merchants report that sales of packages for the month of April equal the most prosperous years, and that business from January 1 to the last of April was equal to, or in excess of, good years, but the values would indicate a shrinkage. Though profits are not large this trade has not been at a loss.

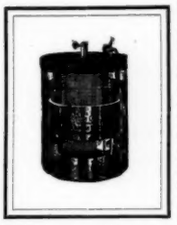
Says the Boston *News Bureau* of June 5: "Sentimentally the business situation has improved vastly this week. The rapid progress of the tariff bill in Congress, the continued favorable outlook for crops, the utterances of President McKinley and Secretary Gage and the encouraging reports of salesmen in the West have combined to induce greater confidence in the future.

"We probably shall not witness any great expansion of contracts until the tariff bill is an accomplished fact, and still the nearer we get to that result the firmer prices should be. Just so soon as the average man finds that he is the loser by waiting for to-morrow, just so soon the volume of business will increase."

J. G. WHITE & COMPANY,
Incorporated,
ENGINEERS, CONTRACTORS.
Successors to White-Crosby Company, and J. G. White & Co.,
29 BROADWAY, NEW YORK, N. Y.
Baltimore Office, Equitable Building.

Manufacturers and Dealers **PARTRICK & CARTER CO.** 125 So. 2nd St. PHILADA. PA. ELECTRICAL HOUSE GOODS.

GORDON PRIMARY CELL



The increasing popularity of the Gordon Primary Cell among the Fire Alarm and Police Signal Service of the leading cities, the railroad, telegraph and telephone companies, and the general adoption of our steel enameled cell for gas-engine, launch and marine service attest most highly to its merit, efficiency, adaptability and economic features.

If you wish to read the testimonials in its behalf, and learn its full description, kindly apply for circular and price list, to

GORDON-BURNHAM BATTERY CO.,
82 to 86 WEST BROADWAY, NEW YORK CITY.

WANTED TO EXCHANGE.

Two 15-K. W., 125-volt compound wound Edison Bipolar Dynamos, with self-oiling bearings; also, base frames, Ammeters and Rheostats, for a like outfit of double its capacity.

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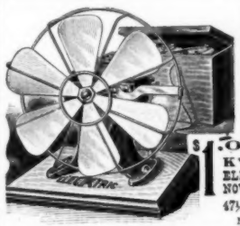
ELECTRIC CONDENSERS.
WM. MARSHALL,
Manufacturer.
STANDARDS A SPECIALTY.
709 LEXINGTON AVENUE. NEW YORK.

THE LEHIGH VALLEY
CREOSOTING CO.
WORKS, PERTH AMBOY, N. J.
Office, Room 1206 Bowling Green Offices, 11 Broadway, N. Y.
Creosoted Lumber, Underground Conduits, Telegraph Poles, Piling and Ties Furnished.



Knapp Battery Motors.
$1.00 UP.
KNAPP ELECTRIC & NOVELTY CO., 47½ Warren St., NEW YORK.

STEAM ENGINEERING
(Stationary, Locomotive, Marine); Mechanical Drawing; Architectural Drawing; Machine Design; Electricity; Architecture; Plumbing; Railroad, Municipal, Hydraulic & Bridge Engineering; Surveying and Mapping; Metal Pattern Cutting; Bookkeeping; Shorthand; English Branches; Mining; Metal Prospecting.
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THE CAZIN POWER WHEEL
(Patented March 16, 1897).
Will furnish more power per cubic foot of water than any other wheel made.
Can be operated as a rotary steam engine at low water periods.
American Impulse-Wheel Co. of New York,
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FOR SALE—INCANDESCENT DYNAMOS.
110 VOLT.

1	8-light	Edison.	
1	12	"	"
1	30	"	Thomson-Houston.
7	50	"	Mayo.
1	50	"	Triumph Multipolar.
1	50	"	American Engine Multipolar.
1	50	"	Mather.
1	55	"	Edison.
2	60	"	Westinghouse.
1	60	"	Richter.
1	75	"	Eddy.
1	80	"	Westinghouse.
1	100	"	Triumph.
2	110	"	Edison.
2	150	"	"
1	170	"	Royal.
1	200	"	Westinghouse.
1	200	"	Hawkeye.
1	200-light	Western Electric.	
1	225	"	Thomson-Houston.
2	250	"	Mather.
1	250	"	United States.
3	270	"	Edison.
1	300	"	Mather.
1	300	"	Rockford.
2	350	"	Mather.
2	350	"	Edison.
1	360	"	Westinghouse.
1	420	"	United States.
1	430	"	Edison.
1	500	"	Brush.
1	650	"	Westinghouse.
1	750	"	Edison.
1	1,000	"	"
1	1,000	"	Standard M. P.

All machines IN STOCK for immediate delivery. Send for our monthly **BARGAIN SHEET**, giving complete list of machines; 220 and 500-volt Generators, Alternators, 110, 220 and 500-volt Stationary Motors, Arc Dynamos and Lamps, Transformers, Instruments and Supplies.

CHAS. E. GREGORY COMPANY,
47-49-51-53 S. Jefferson Street, - CHICAGO, ILL.

Kindred.... ...Interests

The fan season may now be said to be fairly opened, and a large business should be done during June and July. The Electric Appliance Company, Chicago, are in the field with a large and complete fan catalogue, showing their full line of alternating and direct-current desk, wall and ceiling fans. This catalogue will be valuable to every purchaser of electric fans of any kind.

The Williams-Abbott Company guarantees all of its bells against infringement. The company owns Ringer patent of March 9, 1897, and have other patents pending. The bells are guaranteed to be of the best material and workmanship, and a test card and guarantee accompany each one. The magnets are all full nickel-plated, and the bell is finished throughout in the finest manner possible, and, without a doubt, is one of the most durable, handsome and reliable magneto bells obtainable.

The Manhattan Electrical Supply Company, of New York, are large manufacturers of telephone supplies. The house is a thoroughly responsible one. In a recent circular the Manhattan company, in speaking of the Berliner patent, says: "We shall continue to make telephone transmitters that have 'variable resistance.' We are perfectly responsible and are anxious for a chance to defend a suit for infringing this patent. Telephones are sold on a small margin of profit and the public take no risk in the use of same."

The Queen Construction Company are erecting in Flushing, L. I., N. Y., a new electric light plant. The building is divided into two portions —a boiler house 40 by 42 feet, and an engine and dynamo room 43 by 71 feet. The walls are of brick and have substantial stone foundations, and the roof is of iron covered with metal covering. The building, when completed, will be absolutely fireproof. The roof of the engine and dynamo room is lined with the Berlin Iron Bridge Company's patent anticondensation roof lining, which prevents condensation of moisture on the underside of the roof, a result which is absolutely necessary to obtain in a building filled with electrical apparatus. The Berlin Iron Bridge Company have the contract for furnishing and erecting the steel-frame work and the covering.

The C & C Electric Company, 143 Liberty Street, New York, have recently concluded arrangements with Messrs. Sargent & Lundy, of No. 13 and 15 Monadnock Block, Chicago, Ill., whereby this firm, on and after August 1, will act as their selling agents for Chicago and the western States. During the interim, Mr. F. D. Sweeten, who has long been the manager of the C & C company's Philadelphia office, will look after the company's interest in the territory above mentioned. The company's office is now at 934 Monadnock Building, where Mr. Sweeten can be found, and where business will be transacted until the change alluded to above shall go into effect. Mr. Martin J. Insull, of Messrs. Sargent & Lundy, will take special charge of the interests of the C & C Electric Company.

An Enterprising St. Louis Electrical Company.

The St. Louis Electrical Supply Company, which for some time past has been manufacturing a high-class line of telephone apparatus on a somewhat limited scale, found the demand for its goods in this line so encouraging as to warrant it setting apart a portion of its factory for the production of telephone instruments and equipments on more extensive lines. A neatly gotten up catalogue, recently gotten up, contains a concise but complete list of not only the complete telephone sets made by the company in a number of grades and styles to suit various requirements, but gives also prices and cuts of the several parts of instruments for those who wish to construct their own outfits. An illustrated list of all kinds of line and construction supplies is added, and will be found convenient to those in need of material of any kind. The form of transmitter made by the company deserves special mention, as it contains no dust or granules of carbon, but a series of very thin carbon disks, which makes any packing, so often found in other transmitters, an impossibility. The company will send a copy of its catalogue free upon request.

An Interesting Exhibit at the Niagara Falls Convention.

The General Electric Company will occupy the writing-room of the International Hotel, and an exhibit of supplies will be made in the adjacent room. This exhibit will comprise a display of long-burning arc lamps for both direct and alternating-current circuits, the latter a recent development of this company's and one for which they expect an extensive demand. They will also show a number of focusing lamps for high-tension series arc work, as well as long-burning arc lamps for use in series on 220 and 500 volts railway current. The transformer exhibit will include a number of the recent developed Type H transformer, and to make this exhibit more effective all the different parts which go to make up the transformer will be shown in detail, as well as the cores in the various stages of completion. There will be distributed a pamphlet, entitled "Use and Abuse of Transformers," perhaps the most complete treatise on this subject ever issued in the form of commercial literature. In addition to this a number of charts will be hung upon the walls of the rooms showing the regulation and other curves of the Type H transformer. An X-ray set will also be installed at the headquarters, and will be in constant operation. At the store of F. D. Oliver & Company the General Electric Company will make an exhibit of incandescent lamps and lamp signs, while on the veranda of the International Hotel a series of long-burning lamps for 500-volt circuits will serve to enhance the illumination. Quite an extensive stock of literature will be sent to Niagara Falls for distribution. The souvenir for this year will be a small book descriptive of the falls and of the large amount of work the General Electric Company has done in their vicinity. Considerable care has been expended in making this souvenir of a character befitting the occasion. There is a rumor that the General Electric Company is preparing something for the ladies, but the convention committee of that company refuse to disclose their plans in this direction.

DEER PARK
ON THE CREST OF THE ALLEGHANIES.

To those contemplating a trip to the mountains in search of health or pleasure, Deer Park, on the crest of the Alleghany Mountains, 3,000 feet above sea level, offers such varied attractions as a delightful atmosphere during both day and night, pure water, smooth, winding roads through the mountains and valleys, Cricket grounds, Ball grounds, Golf links, Tennis courts and the most picturesque scenery in the Alleghany range. The hotel is equipped with all adjuncts conducive to the entertainment, pleasure and comfort of guests.

There are also a number of furnished cottages with facilities for housekeeping.

The houses and grounds are supplied with absolutely pure water, piped from the celebrated "Boiling Spring", and are lighted with electricity. Deer Park is on the main line of the B. & O. Railroad, and has the advantage of its splendid Vestibuled Limited Express trains between the East and West. Season excursion tickets, good for return passage until October 31, will be placed on sale at greatly reduced rates at all principal ticket offices throughout the country.

The season at Deer Park commences June 21, 1897.

For full information as to rates, rooms, etc., address D. C. Jones, Manager, Camden Station, Baltimore, Md.

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THE ORIENT ELECTRICAL CO.
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MAKERS INCANDESCENT LAMPS.

$25.00, $15.00, $10.00
In Gold, will be paid to the three purchasers sending in the most solutions of this novel Egg Puzzle. Interests and amuses young and old. Requires patience & steady nerves. Send 15 cts. for Puzzle, (2 for 25 cts.) and learn how to secure a PRIZE.
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SPEAKING TUBES, WHISTLES, ANNUNCIATORS.
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THOMAS HILL, Jr.,
Experimental Electrical Work
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REPAIRING IN ALL ITS BRANCHES.
Special Apparatus Designed and Built.
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THREE GREAT TRAINS.
"KNICKERBOCKER SPECIAL"
Between ST. LOUIS, INDIANAPOLIS, CLEVELAND, NEW YORK and BOSTON.
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Pocket Kodaks, Cartridge Kodaks. Bullets and Bulls-Eyes, $5.00 to $25.00.
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Containing the names, with capital and credit ratings, of all business houses in the electrical trade in the United States and Canada.
Over 10,000 Correspondents.
Special facilities for prompt collections.
P. M. MOWREY, General Manager.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 1, 1897.

583,452 Electric switch; T. H. Brady, New Britain, Ct.—A split terminal and a lever handle, which is provided with a terminal disk, of uniform thickness, and is pivoted thereby between the cheeks of that terminal, with a circuit-closing blade, which is of the same uniform thickness between those cheeks, and is adapted to turn on said disk.

583,524 Underground railway conduit; A. G. Wheeler, New York, N. Y.—A slotted conduit comprising slot-rails, supports to which the same are bolted, and guide-rails which are secured to the slot-rail supports by being inserted between said slot-rails and their supports.

583,525 Electric railway; A. G. Wheeler, New York, N. Y.

583,575 Collector for electric railways; L. J. Hirt, Brookline Mass.—A frame suspended from the car, a series of contact plates on each side of the frame and insulated therefrom, conducting strips whereby the current is conveyed from the contact plates through the collector, and the insulator between the series of contact plates on each side of the frame.

583,586 Electric igniter for gas engines; G. Westinghouse, Jr., Pittsburgh, Pa.—A gas cylinder, a removable cap, or bonnet, two movable electrodes mounted in the cap, or bonnet, each adapted by its movement to make and break a circuit, and an actuating mechanism for operating either of the movable electrodes.

583,589 Electric connector; F. E. Austin, Hanover, N. H.

583,618 Vacuum electric arc furnace; H. Eldridge, Galveston, Tex.—An upright furnace casing, means for temporarily sealing the casing hermetically at the top and bottom, a pot cathode supported within the casing and having a carbon lining included in the electric circuit and a vertically adjustable hollow cylindrical anode supported within the cathode and forming the receptacle for holding the substance to be fused.

583,622 System of electrical distribution; P. M. Heldt, Chicago, Ill.—Consists of a source of polyphase current, with a plurality of primary coils in circuit therewith, and a plurality of secondary coils in secondary circuits, said secondary coils being disposed in substantially equal inductive relation to each of said primary coils.

583,630 Electric gas lighter; J. Y. Parke, Philadelphia, Pa.

583,633 Thermostat; A. Roesch, Brooklyn, N. Y.

583,644 Electric burglar and fire-alarm; J. R. Fraser, Chicago, Ill.

583,787 Electric insulator; W. Christie, San Francisco, Cal.—Comprises a metal casing having a bottom closure provided with an opening near one side, and insulating material secured in the upper portion of the casing, a zig-zag suspending rod extending through the opening in the bottom closure and connected to the insulating material in the upper portion of the casing and an inverted cup-shaped condensing plate arranged within the casing between the lower and central horizontal portions of the suspending rod.

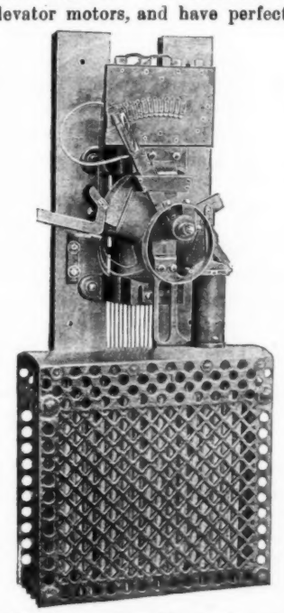
583,810 Secondary battery; J. H. May, London, Eng.—The method of applying a coating of India-rubber to a cover or envelop for secondary batteries, consisting in first treating said cover or envelop with a solvent of the material composing it, and applying to it while in a soft condition a coating of India-rubber.

583,820 Fusible socket for electric lamps; S. H. Russell, Watsonville, Cal.

583,880 Electric brake; R. M. Hunter, Philadelphia, Pa.

New Form of Motor Starter.

The Card Electric Company, of Mansfield, Ohio, have been experimenting with various forms of automatic starters or controllers for elevator motors, and have perfected



"CARD" AUTOMATIC MOTOR STARTER.

a motor starter with features that would seem to make it an effective apparatus for service with freight or passenger elevator.

The rheostat and operating parts are mounted on a wood frame. The construction of the automatic rheostat cut-out is simple and the magnetic force to operate it is very strong, far in excess of any requirements. The practical success of a starter depends on the reliability of the swinging arm to properly divert current from the rheostat when the circuit is closed. The electro-magnet used is powerful and has a swinging armature wound and energized by the same current, creating a powerful torque, and this torque is so controlled by the connecting mechanism that a constant, steady pull is maintained throughout the full movement of the arm. The bearings are mounted on balls, saving oiling and eliminating danger of sticking because of dirt or friction.

The rheostat used with this starter is of the "Card" type, made up of iron wire coils mounted on iron frames. The reversing switch, which is a part of the Card company's elevator equipment, is of the quick-throw type and has carbon break tips on all the contact blades.

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U. S. and Foreign PATENTS.
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Patent Suits and Interferences.
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Working Drawings.
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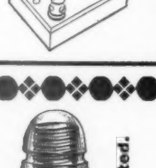

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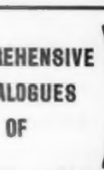

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ELECTRIC RAILWAY NOTES.

The Oak Park branch of the Chicago & Northern Pacific Railway Company is to become a trolley road.

Captain J. M. Murphy, whose third-rail system was tried in Westport, Ct., last year, has organized a company in New York, and has signed a contract with President Diaz, of Mexico, to build a road on his system in the city of Mexico.

The Illinois Central Railroad Company has decided to install the "third-rail" system of electric traction on its suburban lines between Randolph and Sixty-third streets in Chicago. This will be a crucial test of the system, and upon its success or failure will depend the action of other large steam roads in Chicago having heavy suburban business.

A plan is on foot for the absorption by the Fair Haven, Ct., & Westville Railroad of all the street railroads of the city. There are now three systems here; namely, the Fair Haven & Westville, the New Haven Street Railroad Company and the Winchester Avenue Railroad Company. The project is to consolidate these three and give one corporation control. If the roads are bought outright $2,500,000 in cash will be necessary, and there is a mortgage of $1,500,000.

The Kings County Elevated Railroad Company, of Brooklyn, N. Y., has decided to use electric motors, and will commence work immediately after the completion of tests on the South Side elevated road in Chicago. The system is known as the Sprague unit system. It is a comparatively new invention, similar to that in use on many new electric elevators. Electricity is supplied by wire, by a third rail or by storage battery. The Brooklyn company favors the third rail.

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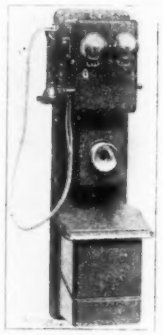

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